

A REVISION OF THE AUSTRALIAN PARCOBLATTINI
(BLATTARIA: BLATTELLIDAE: BLATTELLINAE)

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Diagnostic characters and descriptions of species belonging to 4 genera of Australian Blattellinae, tribe Parcoblattini are presented. *Gislenia* Princis is synonymised with *Neotemnopteryx* Princis. *Shawella* Princis and *Franwalkeria* Princis are synonymised with *Paratemnopteryx* Saussure. *Neotemnopteryx ferruginea* (Tepper), *Gislenia apicalis* (Walker), and *Gislenia australis* (Brunner) are synonymised with *Neotemnopteryx fulva* (Saussure). *Paratemnopteryx blattoides* Tepper is synonymised with *P. coultoniana* (Saussure). *P. zeitzi* Tepper is synonymised with *P. rufa* (Tepper). *Symploce centralensis* Roth, previously known only from New Guinea, occurs in Australia, and is transferred to *Paratemnopteryx*.

There are 10 species of *Neotemnopteryx*, 3 of which are new combinations: *fulva* (Saussure), *australis* (Saussure), and *douglasi* (Princis); the remaining 7 are new taxa: *gloriosa*, *bifurcata*, *glossa*, *concuva*, *elliptica*, *nana* and *styliparedru*. A neotype is designated for *Neotemnopteryx fulva* (Saussure). *Paratemnopteryx* contains 10 taxa of which 3 were correctly placed: *australis* (Saussure), *rufa* (Tepper), and *atra* Princis; 3 are new combinations: *coultoniana* (Saussure), *glauerti* (Princis), *centralensis* (Roth); 4 are new taxa: *stonei*, *howarthi*, *broomehillensis* and *suffuscula*. One species of *Neotemnopteryx* and 3 species of *Paratemnopteryx* are cavernicolous. *Trogloblattella* Mæckerras contains 1 Australian cavernicolous species, *nullarborensis*. The new genus *Keyella* contains 2 new taxa, *gayi* and *armidalensis*. Keys are provided to separate the genera and to distinguish between males of the species. □ *Blattaria*, *Blattellidae*, *Parcoblattini*, *Australia*, *cockroaches*, *cave insects*.

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According to Rentz and Cameron (1983) the Blattellidae of Australia are among the poorest known cockroaches found on that continent. They suggest that the species belonging to this family may be twice the number actually recorded. From my studies thus far, they may be too conservative in their estimate of undescribed taxa.

This paper includes the following 7 closely related blattellid genera belonging to the tribe Parcoblattini: *Neotemnopteryx* (including *Gislenia*), *Trogloblattella*, *Paratemnopteryx* (including *Shawella* and *Franwalkeria*) and *Keyella*. The specimens were loaned to me by the following museums and their curators or collection managers: ANIC - Australian National Insect Collection, CSIRO, Canberra, ACT, Australia; Dr D.C.F. Rentz and Mr John Balderson; ANSP - Academy of Natural Sciences of Philadelphia, Philadelphia, USA, Mr Donald Azuma; BMNH - British Museum (Natural History), London, England, Mrs Judith Marshall; BPBM - Bernice P. Bishop Museum, Honolulu, Hawaii, Mr Gordon M. Nishida; DARA - Biological and Chemical Research Institute,

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I have examined some of Saussure's specimens borrowed from the Geneva and Neuchâtel museums. According to Dr Bernd Hauser (pers. comm., 1986), Saussure was an independent scientist and his private collection was transferred to the Geneva Museum after his death. He did not designate types, some

specimens had no labels on them, and he never indicated how many specimens he used in his descriptions. A minimum of 2 specimens was certain only if he described, or gave measurements of both sexes of a species. He made many exchanges with friends and colleagues so that his syntypes, if any, may be widespread in major world collections. The fact that Saussure indicated 'Mus. Neuchâtel' in his publications does not mean that he did not have specimens of the same species in his private collection. Dr Hauser believes that Saussure's specimens in the Geneva Museum are syntypes, even though he listed only Neuchâtel as the location of the specimens, in his publications.

DIAGNOSTIC CHARACTERS

The characters that have been used to distinguish between the genera discussed in this paper are shown in Table 1. A diagnostic character is one that is useful in distinguishing a species or genus from its relatives, but as Key (1970, p.144) points out the 'difficulty here is to know which characters may prove to be needed when all related species have been discovered.' In this paper I attempt to evaluate the generic importance of the characters shown in Table 1, and redefine those genera which I believe to be valid. My conclusions are based for the most part on examination of the type species (including type specimens wherever possible) as well as the known and new taxa.

Wings. 'The fully developed, reduced or absent organs of flight, in one or both sexes, is often

specific and sometimes attributable to nothing more than mere individual variation. Such differences may occasionally be given generic recognition, but only in conjunction with other differential characters of much greater usual stability.' (Hebard, 1929, p.4). Regarding Australian cockroaches, Hebard (1943, p.4, footnote 6) stated 'Different degrees of reduction in the organs of flight have obviously been used as major generic factors, although it is now well known that such characteristics rarely have any generic significance whatever, and indeed such dissimilarity between the sexes is now recognised as characteristics of many species.'

The wing venation of those species with fully developed flight organs (*Neotemnapteryx* and *Paratemnapteryx*) are essentially similar. Whether or not the tegmina and wings are reduced may be intraspecifically variable in some species of a genus, and is of questionable generic value. Princis (1954, p.35) claimed that *Shawella* (= *Paratemnapteryx*) differed from *Gislenia* (= *Neotemnapteryx*) and *Franwalkeria* (= *Paratemnapteryx*) by its reduced wings which do not reach beyond the first abdominal tergum. *Paratemnapteryx couloniana* (Saussure) has brachypterous tegmina and micropterous wings, but the degree of reduction varies, and there are males whose flight organs are fully developed and extend beyond the end of the abdomen. *Neotemnapteryx fulva* (Saussure) males are macropterous and the females may be macropterous or brachypterous.

Male tergal specialisations. 'In males the dorsal surface of the abdomen may always be un-

Genus	Tegmina	Hind Wings	Front Femur Type	Pulvilli	Arolia	Tergal Gland on	
						T1	T7
<i>Gislenia</i> ¹	Fully Developed	Fully Developed	A ₃	Present	Present	Present	Present
<i>Neotemnapteryx</i> ²	Reduced	Reduced	A ₃	Present	Present		
<i>Shawella</i> ¹	Reduced	Reduced	A ₃	Present	Present	Present	Absent
<i>Franwalkeria</i> ¹	Fully Developed	Fully Developed	A ₃	Present	Absent	Present	Absent
<i>Paratemnapteryx</i> ¹	Reduced	Reduced	A ₃	Absent	Absent		
<i>Keyella</i> ³	Fully Developed	Fully Developed	B ₁	Present or Absent	Present	Present	Present or Absent
<i>Trogloblatiella</i> ⁴	Reduced	Reduced	B ₂	Absent	Absent	Present or Absent	Present

¹From Princis (1954). ²From Princis (1951), based on female only. ³This paper. ⁴From Mackerras (1967).

TABLE 1. Characters that have been used to distinguish between 7 genera of Parcoblattini.

specialised in certain genera and show a distinctive type of specialisation in others, but various differences in specialisation or rarely both types may be found to exist in species of the same genus.' (Hebard, 1929, p.5).

According to Princis, *Gislena* males have a gland on T1 and T7, as compared to *Shawella* and *Franwalkeria* that have only T1 modified. The abdominal tergum(a) on which the sexual gland(s) is/are located may be a good generic character (Roth, 1969). But as pointed out by Hebard, the number of modified segments, and their position and morphology may vary in the same genus. Some examples of this are: in *Blattella* spp., the tergal glands may occur on T7 only, or on T7 and T8, and their morphology differs between different species-groups (Roth, 1985a). The Australian species discussed here belong in the Parcoblattini, and of special interest is the American genus *Parcoblattia* Hebard whose males have glands on T1 only (6 spp.), T1 and T2 (4 spp.), or they are absent (2 spp.) (Hebard, 1917). A striking example of uniformity in position and morphology of male tergal glands on T7 and T8 is found among species of *Ischnoptera* Burmeister (Roth, 1969, figs 47-53).

The degree of development and morphology of the gland may differ between species and may be diagnostic (i.e., deep or shallow fossae, with or without associated setae, or whether setal patches are dense or sparse). *Neotemnapteryx* spp. males always have T1 modified, but based on new taxa, T7 may or may not be modified. In *Neotemnapteryx fulva* the first abdominal tergum has relatively few setae along the anteromedial margin of T1, and sometimes these are difficult to see because they are hidden by the hind margin of the metanotum. In his original redescription of *Shawella coultoniana* (= *N. fulva*) Princis (1951, p.61) stated that the male's abdomen is unspecialised, but later (1954, p.35) he corrected this. A similar tergal gland is found on T1 of *Paratemnapteryx*. The gland on T1 of *Neotemnapteryx* often covers a larger area, and the group of setae is denser, exposed, and located in about the middle of the segment.

Legs. Hebard (1917) defined 2 kinds of spines on the anteroventral margin of the front femur: those armed with a row of spines which decrease gradually in size and length distad (Type A) (p.12) and those armed with a row of heavy proximal spines, succeeded by a row of more slender, shorter distal spines (Type B) (p.11). Later (Hebard, 1929, p.5) stated that the margin may have an elongate row of minute piliform

spines ('type A') or a row of heavy spines which decrease gradually in size distad ('type B'), two or three apical spines furnishing an additional feature of high importance. These definitions are not consistent with his earlier ones. I follow his (1917) original definitions as do recent workers (e.g. Bruijning, 1948, p.33; Bey-Bienko, 1950, pp.15-17, fig. 5) and recognise the following types of front femurs (numerals denote the number of terminal spines, exclusive of the genicular spines); hairlike setae are not considered in the classification:

1. Types A₂, A₃, A₄: long, robust spines which gradually or sometimes suddenly become shorter towards the apex of the femur, the 2 to 4 terminal spines of unequal length, the most distad longest; the first of the terminal spines may be very short and not much longer than the one preceding it.

2. Types B₂, B₃: one or more large proximal spines succeeded by a row of minute piliform spinules, terminating in 2 or 3 large spines.

In some instances the row of spines may be uniform in length and the size of but stouter than piliform spinules; or there may be a few piliform spinules among the small heavy spines. These forms may be intermediate between Types A and B, but usually are considered Type A.

3. Types C₂, C₃: row of piliform spinules only.

4. Types D₁, D₂: robust spines and piliform spinules absent.

Sometimes a genus may have 2 types of front femurs. *Balta* spp. have Type B or C (Hebard, 1943). The Parcoblattini discussed here have Types A or B. Type D femurs are found in *Choristima* Tepper, *Choristimodes* Hebard, *Ectoneura* Shelford, and *Stenectoneura* Hebard.

'The number and type of pulvilli, armament of the ventral surface of the tarsi and development of the arolium has proved to be useful in many ways, while the symmetry or specialisation of the tarsal claws are features of importance.' (Hebard, 1920, p.3). Princis (1974, p.518) quoted this sentence and so strongly believed in the importance of the presence or absence of pulvilli and arolia that he used them as a principal diagnostic character for certain genera. Bruijning (1948, p.33) also stated that whether or not the arolia are well developed has 'high generic value.' This may well be true for some genera, but apparently is of less significance in a number of taxa, including some closely related to *Paratemnapteryx* Saussure, discussed in this paper.

Shelford (1908a, p.34), and Rehn (1922, p.65) indicated that in *Tritia* spp. (Polyphagidae), the

presence or absence of tarsal arolia varies, and does not have as much taxonomic importance in the polyphagids as in the Blattidae. But even species of *Tryonicus* Shaw (Roth, 1987a, p.152) and *Neostylopyga* Shelford (Roth, 1988, p.316), both Blattidae, have some species without arolia, and with some or all pulvilli absent, whereas most of the species in these genera have the structures.

There are several closely related Australian genera in the Blattellinae (Parcoblattini) in which the presence or absence of pulvilli and arolia has been used as an important character to distinguish between them. Pulvilli and arolia are present in *Neotemnopteryx* and absent in *Paratemnopteryx* (original diagnosis) and *Trogloblattella*. In *Shawella* (= *Paratemnopteryx*) pulvilli are present or absent, and in *Frankia* (= *Paratemnopteryx*) pulvilli are present, arolia absent. In his original diagnosis of *Shawella* (based only on *couloniana*), Princis (1951, p.61) stated that small pulvilli are present on the 4 proximal tarsomeres. However, pulvilli are absent in *Shawella douglasi* Princis (= *Neotemnopteryx douglasi*) (Princis, 1963, p.11). Sometimes it is difficult to determine if pulvilli are absent. In *Trogloblattella* the pulvillar regions on most tarsal segments are heavily sclerotised and bear small spines, but some spines form a line limiting a clear apical area of the tarsomere. A 'normal' pulvillus is convex and generally is not completely surrounded by short stout spines. Princis and Mackerras probably considered pulvilli absent if, in lateral view, the apex of the tarsomeres do not show small, colourless convex swellings that protrude beyond the margins of the segments. Perhaps the presence of clear, non-protruding structures at the apex of the tarsomeres (viewed in ventral view) should be considered as subobsolete pulvilli; probably these are nonfunctional and cannot be used in climbing.

Mackerras (1967, p.43) stated 'Why the tarsi should lack pulvilli and arolia is not obvious, but they are so frequently lost in cavernicolous cockroaches that they must be disadvantageous in some way; possibly mud adheres to them and retards progress. Among their relatives living on the surface neither *Shawella couloniana* nor *Gislenia australica* (Brunner), nor *G. fulva* (Saunders) have pulvilli in the nymphal stages. These structures are only acquired at the last ecdysis. It is noticeable that nymphs cannot run up the sides of a glass container in the way that adults can, so that *T. [trogloblattella] nullarborensis* would not

be able to negotiate a smooth vertical surface. *Shawella douglasi* which has so far only been found in caves, lacks pulvilli in nymphs and adults, but small arolia are present in both. In another related genus, *Paratemnopteryx*, lack of pulvilli and arolia is cited as a generic character.' Although she didn't say so, Mackerras may have been questioning the generic importance of the presence or absence of pulvilli and arolia in this group of cockroaches. Although absence of pulvilli and arolia may be associated with strictly cave species, these characteristics may occur in truly epigeal species as well.

During climbing, the tarsal claws function on rough surfaces whereas the arolia and pulvilli are important in climbing smooth surfaces (Roth and Willis, 1952; Arnold, 1974). Christiansen (1965) found that the more elongated tarsal claws in cave collembola reduced adhesion by the surface tension of water in moist caves, and this facilitated locomotion on wet surfaces. In a study of some domiciliary pest cockroaches, Roth and Willis (1952, p.499) found that at least two species, *Blatta orientalis* Linn. and *Periplaneta australasiae* (Fab.) have great difficulty walking on a smooth horizontal surface like glass, because their first and sometimes second pulvilli (euplantulae) adhere to the substrate. The insect walks readily if its body is raised high above the surface. But if the body is held close to the substrate and its legs are extended so that the first pulvilli of the mid and/or hind legs touch the surface the cockroaches have difficulty pulling or lifting the tarsi away from the smooth substrate. In some instances the insect will actually pull itself free leaving the tarsi adhering to the glass (Roth and Willis, 1952, fig. 5).

Whether or not the presence or absence of pulvilli and arolia influences the locomotor ability of cockroaches on different cave surfaces remains to be determined. Pulvilli and arolia are adaptive characters (Arnold, 1974), although their loss is not restricted to cave habitats, and they are insufficiently stable to be used as a principal diagnostic generic character in the genera discussed here. *Ischnoptera peckorum* Roth (Blattellidae) and *Neostylopyga jambusanensis* Roth (Blattidae), both cavernicolous species, differ principally from other epigeal members of their respective genera, by the absence or reduction of eyes, absence of some or all pulvilli, and absence of arolia. There is no need to erect new genera based on these differences alone (Roth, 1988).

Hebard (1917, p.9) stated that 'It must be

remembered that until the Blattidae of the world are monographed, the relative values of all diagnostic features can not be fully determined. Mackerras (1967, p.39) stated that *Trogloblattella* has the characters of *Gislenia* but is modified for a cave existence. In *Franwalkeria*, *Shawella* and *Paratemnopteryx*, we find intermediate stages towards a complete loss of pulvilli and arolia, and the species in these genera generally have reduced eyes. My study of these three genera indicates that they are congeneric. Except for specific determinations, Princis tended to ignore similarities in male characters (if males were known) when he diagnosed genera. I believe that male styles, genital phallomeres, tergal glands, which tend to link the Parcoblattini together, are more important than the presence or absence of pulvilli and/or arolia, although in some instances the latter may be used for species differences.

Size. The Parcoblattini contains some of the largest species of Blattellidae (e.g. *Neotemnopteryx gloriosa* n. sp., *Paratemnopteryx broomchillensis* n. sp., *Trogloblattella nullarborensis* Mackerras). Considerable size variation occurs in some species and the difference between the smallest and largest specimens is so great that they appear to be different species (e.g. *Paratemnopteryx centralensis* (Roth)). However, if all important male characters (supraanal and subgenital plates, styles, and genitalia) are similar between the different sized specimens, I have considered them to be one taxon. Measurements are given in millimetres.

Colouration. The Parcoblattini are more or less unicolourous and for the most part yellowish brown (*Neotemnopteryx*), or dark-, reddish- or blackish-brown (*Paratemnopteryx*). Head, pronotum, and tegmina do not have distinctive markings.

KEY TO AUSTRALIAN GENERA OF PARCOBLATTINI based mainly on male characters

1. Anteroventral margin of front femur Type A2

Anteroventral margin of front femur Type B3

2. Epigeal species: Eyes extending below level of antennal sockets (Figs 2B,5C,13C). Tegmina and wings fully developed. Styles usually asymmetrically placed on hind margin of sub-

genital plate (Fig. 2F), rarely close together near mid-line (Fig. 13E). Intercercal ridge usually present on undersurface of supraanal plate (Figs 1D,13B), rarely subobsolete (Fig. 12B), or absent. Pulvilli present on 4 proximal tarsomeres, arolia present. First abdominal tergum specialised, the setae located in a group medially; seventh abdominal tergum with or without a setal specialisation. Cavernicolous species: Eyes reduced, not extending below level of antennal sockets (Fig. 14B-D). Tegmina reduced, width normal (Fig. 14A), hind wings vestigial. Pulvilli absent from all tarsomeres, or with a subobsolete pulvillus on the fourth segment only *Neotemnopteryx*

Epigeal and cavernicolous species: Eyes reduced, usually not extending below level of antennal sockets (Figs 16B,20D,22B), rarely well below level of sockets (Figs 29A,31A). Tegmina often reduced in length, rarely fully developed (Figs 16C,E,24A). Hind wings usually reduced or vestigial (Figs 16C,E,25A). Styles usually symmetrically placed, wide apart on hind margin of subgenital plate (Figs 17D,E,18D,24D). Intercercal ridge absent. First abdominal tergum specialised, the setae arranged or dispersed along the anterior region of segment (Figs 17B,20C,27C), or with a small group of setae located anteromedially partly or sometimes completely hidden under hind margin of metanotum; seventh abdominal tergum usually unspecialised, rarely with a large, dense, medial group of setae (Figs 18B,27A). Pulvilli present, subobsolete, or absent, arolia small or absent *Paratemnopteryx*

3. Eyes present. Tegmina and wings fully developed. First abdominal tergum with a pair of medial setal tufts (Figs 32A,33A) *Keyella*

Eyes absent. Tegmina and wings reduced to small, coriaceous, lateral pads (Fig. 15A). First abdominal tergum with an elliptical depression without any or only a few minute setae (Fig. 15D) *Trogloblattella*

Neotemnopteryx Princis

Neotemnopteryx Princis, 1951, p. 61. Type species: *Temnopteryx ferruginea* Tepper, by monotypy.
Gislenia Princis, 1954, p. 33. Type species: *Ischnoptera julva* Saussure, by selection. N. Syn.

REMARKS

It is impossible to separate *Neotemnapteryx* from *Gislenia* using Princis' characters. The holotype of *ferruginea* is an unusually small female of *Gislenia fulva* with reduced tegmina that do not reach to hind margin of T7, and wings only slightly smaller; in spite of wing reduction the cubitus has 6 complete and 4 incomplete branches, similar to specimens from a colony established under the name *Gislenia australica*

at CSIRO, Canberra. I have not seen the type of *Ischnoptera fulva* but I have examined specimens which Princis determined as *Gislenia fulva* and which I find is conspecific with *Gislenia australica* and *Neotemnapteryx ferruginea* both of which I consider synonyms of *fulva*.

Princis (1969, p.732) listed 1 species of *Neotemnapteryx* and 6 species of *Gislenia* (1969, p.729). The former (*ferruginea*) and 3 Australian species of *Gislenia* belong in *Neotemnapteryx*

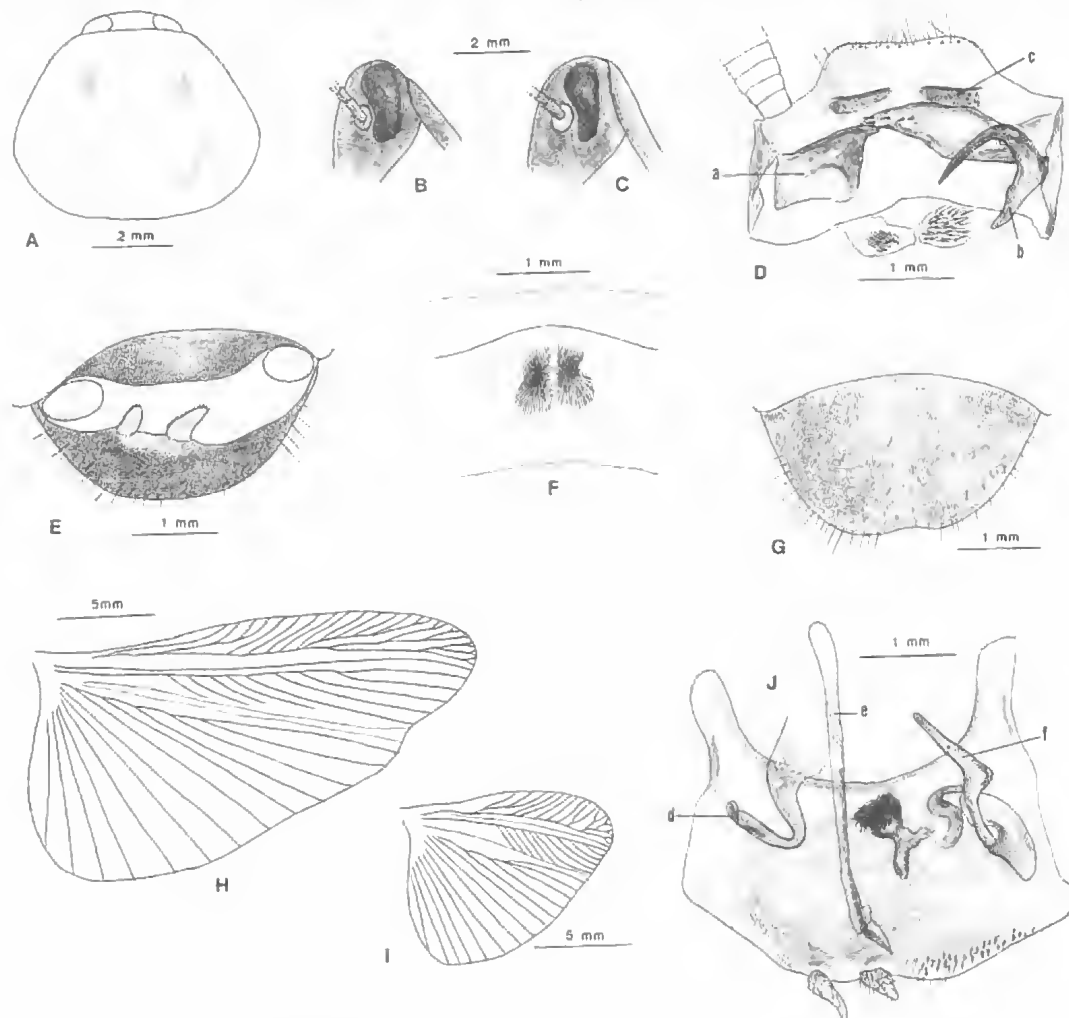


FIG. 1. *Neoteninopteryx fulva* (Saussure). A, B, D-H, J, ♂♂: A, Pronotum; B, Eye (lateral view); C, ♀, eye; D, Supraanal plate and paraprocts (ventral view); E, Supraanal and subgenital plates, styles (rear view); F, Setal gland on seventh abdominal tergum; G, Subgenital plate (ventral view; styles reflexed dorsad and not visible); H, Hind wing; I, ♀, hind wing; J, Subgenital plate and genitalia (dorsal view). Abbreviations: a, left paraproct; b, right paraproct; c, intercercal ridge; d, left hooklike genital phallomere; e, median phallomere; f, right phallomere. Localities: A, D, J, lectotype of *Ischnoptera australica* Brunner, Tarangower, N.S.W.; B, C, H, I, Canberra, A.C.T.; E-G, Black Mt., A.C.T.

which is restricted to that continent. The two Indian species, *Gislenia brevipes* (Walker) and *G. himalayaca* (Brunner), are species of *Episymploce* (Roth, 1987b). *Gislenia indica* (Brunner) from Malacca, West Malaysia is a *Symploce* (Roth, 1986). I recognise 10 species of *Neotemnopteryx* of which 6 are new and 3 are

new combinations. One species is cavernicolous, the others epigeal.

The distribution of species of *Neotemnopteryx* is shown in Fig 34.

DIAGNOSIS

Epigeal species. Eyes well developed usually

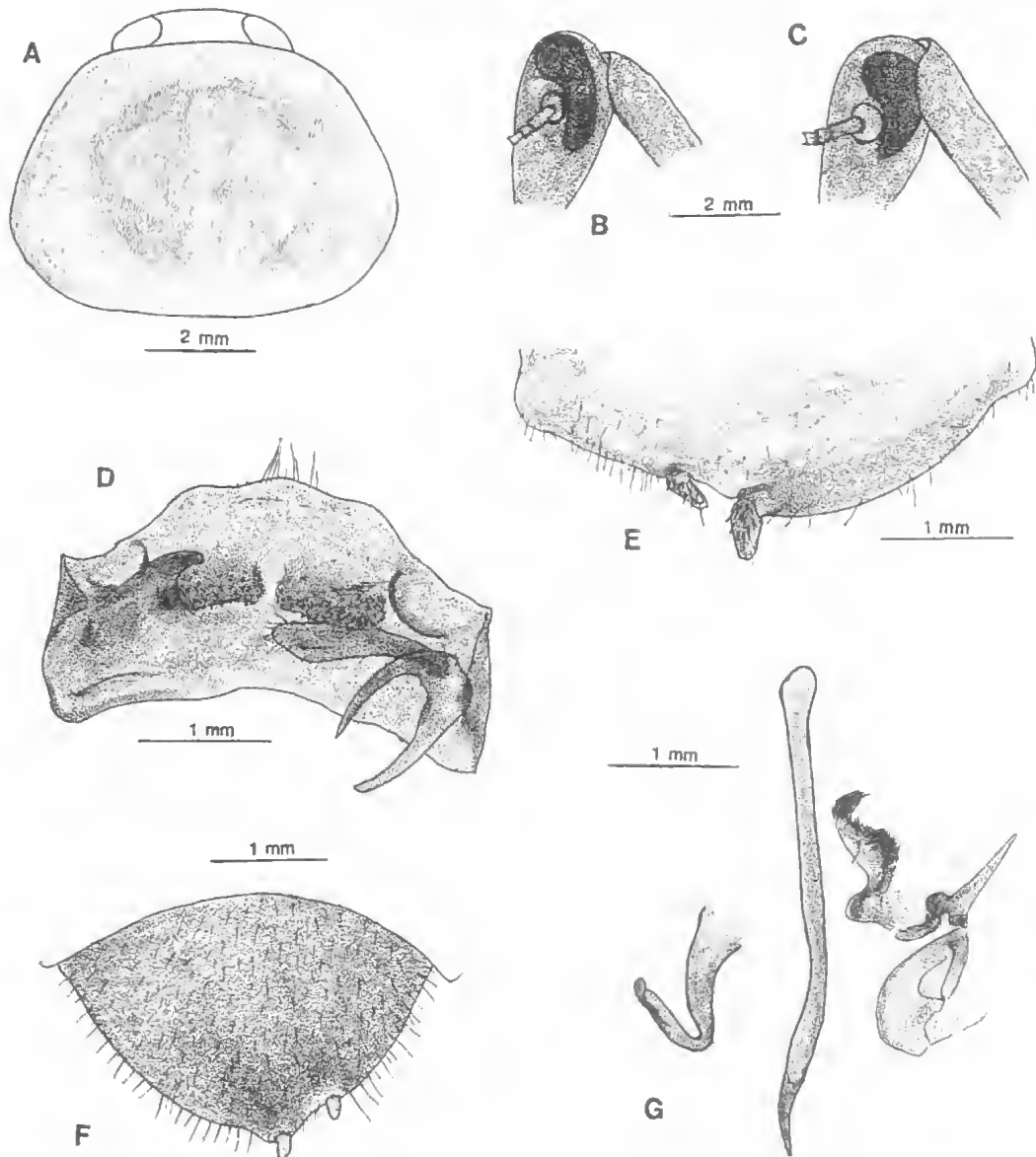


FIG. 2. *Neotemnopteryx fulva* (Saussure). ♂♂: A, Pronotum; B, C, eye (lateral view); D, Supraanal plate and paraprocts (ventral view); E, Distal region of subgenital plate, and styles (dorsal view); F, Subgenital plate and styles (ventral view); G, Genital phallomeres (dorsal view). Localities: A, D, E, G, Australia (no exact locality), holotype of *Periplaneta apicalis* Walker; B, Perth, W.A.; C, D, Margaret River, W.A.

extending below level of antennal sockets (Figs 1B,5C,6D). Tegmina and wings usually fully developed extending beyond end of abdomen; in one species (*fulva*) some females have reduced tegmina not reaching end of abdomen, hind wings only slightly smaller, their veins distinct. Cubitus vein of hind wing with 2-6 (usually 4-6) complete and 2-7 (usually 3 or more) incomplete branches, apical triangle absent or subobsolete (Fig. 1H,I). Anteroventral margin of front femur Type A3; pulvilli present on 4 proximal tarsomeres, tarsal claws simple, symmetrical, arolia present. *Male*. First abdominal tergum specialised, the dense group of setae exposed medially on segment. Seventh abdominal tergum with or without specialisation; if present may vary from dense to sparse (Fig. 3D-G). Supraanal plate usually with ridge or shelf on ventral surface between cerci (intercercal ridge); this may be darkly sclerotised extending ventrad into genital chamber (Figs 5B,8C) but sometimes is reduced (Fig. 1D), subobsolete (Fig. 12B), or absent (Fig. 6B). Paraprocts dissimilar, right one larger, often with spinelike processes (Figs 1D,8D-F). Styles present, partially covered by small dark spines, usually asymmetrically placed, right one at or near apex of plate, the other to its left (Fig. 2E,F), rarely both symmetrically located at apex (Fig. 13E). Genital hooklike phallomere on left side. Ootheca rotated 90° prior to deposition.

Cavernicolous species. In the one cave-dwelling taxon (*douglasi*) eyes are reduced and do not extend below level of antennal sockets (Fig. 14B-D). Pulvilli are lacking from all tarsomeres or a subobsolete pulvillus occurs on fourth tarsomere only.

KEY TO MALES OF *NEOTEMNOPTERYX*

Neotemnopteryx fulva appears twice in the key because its tergal gland on T7 is variable and some individuals apparently lack this specialisation.

1. Eyes reduced, not extending below level of antennal sockets (Fig. 14B-D). Tegmina reduced reaching to T5 or T7 (Fig. 14A). Hind wings vestigial. (cavernicolous) *douglasi*
- Eyes well developed, extending below level of antennal sockets (Figs 2B,5C). Tegmina and wings fully developed reaching beyond end of abdomen. (epigeal) 2

2. Styles close together at or near apex of subgenital plate (Fig. 13E) *styliopredra*
- Styles not as above 3
3. Posterior halves of lateral margins of pronotum, straight, weakly oblique (Figs 6A,7A) 4
- Posterior halves of lateral margins of pronotum not straight 5
4. Supraanal plate subtrapezoidal (Fig. 6B). Right style decidedly more robust than the left one (Fig. 6E) *australis*
- Supraanal plate produced, tongue-shaped (Fig. 7C). Right and left styles about same size (Fig. 7B,D) *glossa*
5. Hind margin of supraanal plate distinctly concavely excavated (Fig. 10A) *concava*
- Hind margin of supraanal plate not concavely excavated 6
6. Abdominal terga 1 and 7 with setal specialisation 7
- Abdominal tergum 1 specialised, T7 unspecialised 8
7. Right style distinctly more robust than left one (Fig. 5F,G). Paraprocts as in Fig. 5B. Median genital phallomere with square-shaped preapical extension (Fig. 5E) *gloriosa*
- Right and left styles similar (Figs 1J,2E). Paraprocts as in Figs 1D,2D. Median genital phallomere without preapical extension (Figs 1J,2G) *fulva*
8. Pronotum subelliptical, greatest width at about middle (Fig. 11A) *elliptica*
- Pronotum with greatest width below middle 9
9. Median genital phallomere apically bifurcate (Fig. 8G) *bifurcata*
- Median genital phallomere not apically bifurcate 10
10. Pronotum subparabolic (Fig. 12A). Intercercal

ridge subobsolete (Fig. 12B). Genital phal-
lomes as in Fig. 12E *nana*

Pronotum suboval (Figs 1A,2A). Intercercal
ridge distinct (Fig. 2D) Genital phallomes as
in Fig. 1J *fulva*

***Neotemnapteryx fulva* (Saussure)
n.comb.(Figs 1A-J,2A-G,34)**

Ischnoptera fulva Saussure, 1863, p. 156, pl. 1, fig. 18
(♂); Walker, 1868, p. 119; Saussure, 1869, p. 251;
1872, p. 102; Tepper, 1893, p. 55; 1894, p. 172;
Kirby, 1904, p. 81; Shelford, 1908b, p. 7.

Gislenia fulva (Saussure): Princis, 1954, p. 33, fig. 31
(♂ and ♀); 1959, p. 125, N. Comb.

Ischnoptera australica Brunner, 1865, p. 131 (♂);
1862, p. 95 (*Ischnoptera australica* sp. nov., nom.
nud. till 1865); Walker, 1869, p. 145; 1871, p. 31;
Tepper, 1893, p. 50; Kirby, 1904, p. 81 (incorrectly
synonymised under *Ischnoptera australis* Saus-
sure).

Gislenia australica (Brunner): Richards, 1967, pp.
37-39; Roth, 1968, pp. 84, 110, fig. 111 (ootheca);
Princis, 1969, p. 730.

Periplaneta apicalis Walker, 1868, p. 129 (♂), Tep-
per, 1893, p. 105; Kirby, 1904, p. 81 (incorrectly
synonymised under *Ischnoptera australis* Saus-
sure).

Gislenia apicalis (Walker): Princis, 1959, p. 125
(synonymised under *Gislenia fulva*); 1969, p. 730.
N. Syn.

Temnapteryx ferruginea Tepper, 1895b, p. 148 (♀).
Ceratinoptera ferruginea (Tepper): Shelford, 1908b,
p. 20.

Neotemnapteryx ferruginea (Tepper): Princis, 1951, p.
61. N. Syn.

HOLOTYPE (not examined)

♂, Australia. (According to Saussure, the specimen
was in the Mus. Neuchâtel. However, Jean-Paul Haeni
(pers. comm., 1986) informed me that it is not there.
It is not in the Geneva Museum (Dr B. Hauser, pers.
comm., 1986)).

MATERIAL EXAMINED

NEOTYPE (here designated): ♂, Canberra, ACT,
Australia, light trap, 7.xiii.1950, P.B. Carne; in ANIC.
NEW SOUTH WALES. NMWA: ♂ (terminalia slide 45)
lectotype (selected by Princis in 1965), of *Ischnoptera*
australica Brunner, Tarangower; a ♀ 'paratype', from
Qld, 'Boucard ded.' also was selected by Princis, but
it is not conspecific with *fulva* and is *Neotemnapteryx*
gloriosa n. sp. This specimen does not have type
status because Brunner did not describe the female of

australica and did not indicate Queensland as one of
the localities, listing only Tarangower, and Sydney.
ANIC: Armidale, 1♀, 26.i.1960, A. Stock, 1♂,
12.xi.1959, 1♂ (terminalia slide 59), 26.xii.1959, 1♂,
5.i.1960, C.W. Frazier; NE National Park, Pt Lookout,
5200ft. 1♂, 7.xii.1962, A. Stock; Armidale (U.N.E.
Campus), 670m, 1♀, 30.xii.1978, S. Harrington;
Yass, F.C.T., 1♀ (carrying partially rotated ootheca),
10.ii.1929, K. English; Jervis Bay, 1♂ (reared),
19.ix.1951, H.M. Cane. ANIC: Ararwarra, north coast,
at light, 1♂ (terminalia slide 75) 7.xii.1961, 1♂,
9.x.1961, 1♀, 5.xii.1961, C.W. Frazier; Armidale,
1♀, at light, 27.i.1963, C.W. Frazier.

SOUTH AUSTRALIA. MHNG: 1♀ paralectotype (here
designated) of *Ischnoptera australis* Saussure
(misidentification). This female is not *australis* be-
cause the posterior halves of the lateral margin of the
pronotum are rounded, not straight (see Fig. 4A). Its
legmina and wings are fully developed and extend
beyond end of abdomen; cubitus of hind wing with 6
complete and 5 incomplete branches. Based on Dr.
Hauser's comments that Saussure did not indicate
'syntypes' (see introduction) I have designated this
specimen a paralectotype, but I believe it is *fulva*. The
male lectotype of *australis* is in the Neuchâtel
Museum (MHNG). ANIC: 25km E by N of Kimba,
33.05S 136.41E, 2♀ ♀, 3.ix.1981, D.C.F. Rentz.

VICTORIA. NMVM: Fernshaw, ♀ holotype of *Tem-*
napteryx ferruginea Tepper, iii.1958, type no. 4446;
same data as holotype of *T. ferruginea*, 1 (abdomen
missing). ANIC: 8km SW of Moyston, 1♂, 16.xi.
1959, E.F. Riek.

AUSTRALIAN CAPITAL TERRITORY. ANIC: Canberra,
in house, 1♀, 16.ii.1963 (killed 8.iv.1963, 'progeny in
jar 33', 2♂♂, 1♀ nymph (det. *Gislenia fulva* (Saus-
sure) by Mackerras); Canberra, C.S.I.R.O., colony 146
(started from 1♀), 20♂♂ (1 with terminalia slide 43),
17♀♀ (1 with genitalia slide 44), 14♂♂ and 9♀♀
nymphs (det. as *G. fulva* by Mackerras); Canberra, 1♀,
18.ii.1965, 1♀ (carrying partially rotated ootheca),
iii.1952, D.F. Waterhouse; Canberra, light trap,
C.S.I.R.O., 3♂♂, 4.ii.1953, 5♂♂, 23.xii.1953, 1♂,
14.xii.1950, I.F.B. Common, 2♂♂, 25.i.1954, P.J.
Sinclair, 1♂, 29.xi.1950, 2♂♂, 18.xii.1950, P.B.
Carne; Canberra (Turner), 1♂ (terminalia slide 72),
22.i.1969, R.W. Kerr; Black Mt. (some taken in light
trap), 1♂ (terminalia slide 46), 23.xii.1966, 1♂ (ter-
minalia slide 71), 14.i.1963, 1♂, 29.xii.1961, 3♂♂,
17.ii.1962, 1♂, 18.xii.1962, 1♂, 5-6.xi.1966, 1♂,
9.xii.1968, 1♂, 7.i.1969, I.F.B. Common, 1♂,
7.xii.1950, 2♂♂, 18.xii.1950, 1♂, 28.xii.1950, 2♂♂,
13.i.1951, 1♂, 13.i.1953, P.B. Carne, 1♂, 1.xii.1948,
R.W. Kerr.

WESTERN AUSTRALIA. ANIC: Denmark, 1♂,
23.i.1935, K.R. Norris; Dandalup, 1♂ (terminalia

slide 74). 19.i.1948, D. Nicholson; Augusta, 1 ♀, 11.1968, R.F. and E.M. Watson; Victoria Park, 1 ♂, 18.iii.1950, J.A. Mahon; Perth, ex colony 179 (CSIRO), 6 ♂♂, 4 ♀♀ (all with oothecae), 3 ♂♂ and 3 ♀♀ nymphs, xii.1964, BPBM; 5 km W of 'Lake Cave', 1-40m, 1 ♂ (terminalia slide 454), 7-8.xi.1963, J. Sedlacek. MCZH: The following were collected by P.J. Darlington or W.M. Wheeler, on the Harvard Australian Expedition 1931. Pemberton, 2 ♂♂, 1 ♀, 10.xi., 1 ♀, 13.xi.; Margaret River, 3 ♂♂ (1 with terminalia slide 239), 2 ♀♀, 3.xi., 1 ♂, 30.x. ZILS: The following were collected by T. Gislén and reported as *Gislenia fulva* (Sauss.) by Princis (1954, p.33): Margaret River, Mammoth Cave, 8 ♂♂, 5 ♀♀, 10.xii.1951; S Karridale, Hamelin Bay, 2 ♂♂, 11.xii.1951; C. Naturaliste, Bunker's Bay, 3 ♂♂, 1 ♀, 9.xii.1951; Norralup, 1 ♀, 20.i.1952; Denmark, Karri forest, 1 ♀, 26.i.1952. WAMP: Manjimup, 1 ♂; Yallingup, 1 ♂, 1 ♀ (labelled *Gislenia fulva* by Princis, 1954); Cottesloe, 1 ♂, iv.1916; Apple Cross, 1 ♂, 1.xii.1963, G.M. Riley; Margaret River, 2 ♀♀, Kalamunda, 1 ♂, 15.i.1971, P. Shaw; Rottnest, 1 ♂, i.1931 (labelled *G. fulva* by Princis, 1954); Mandurah, 1 ♂, 23.i.1979, R. Easton; Highbury, 1 ♀, 6.ii.1965, W.H. Butler; nr Devils Lair Cave, 3 miles from sea, 1 ♀, 20.iii.1973, A. Baynes; Denmark, 1 ♀, 27.i.1979, R.P. McMillan.

AUSTRALIA (no exact locality). BMNH: ♂ (not ♀ as indicated) (terminalia slide 250) holotype of *Periplaneta apicalis* Walker, presented by C.G. Gréy.

DESCRIPTION

Male. Eyes well developed extending slightly below antennal sockets (Figs 1B, 2B, C). Interocular space about same or slightly greater than space between antennal sockets. Pronotum widest below middle (Figs 1A, 2A). Tegmina and wings fully developed extending beyond end of abdomen; cubitus vein of hind wing with 3-6 complete and 2-6 incomplete branches, apical triangle absent (Fig. 1H). Front femur Type A₃; pulvilli on 4 proximal tarsomeres, tarsal claws symmetrical, simple, arolia small. First abdominal tergum specialised, setae dense and numerous. Seventh abdominal tergum specialised, with setae as dense as on T1 (Fig. 1F), or sometimes sparse and difficult to see. Supraanal plate with hind margin (when flattened) with small median protrusion (Fig. 2D), truncate (Fig. 1D), or rounded; intercercal ridge present but variably developed (Figs 1D, 2D); paraprocts dissimilar, right one with U-shaped sclerotization (Figs 1D, 2D). Subgenital plate weakly asymmetrical, styles small located to left of midline, right one slightly more robust (Fig.

1E, J); in pinned specimens hind margin may be reflexed dorsad (Fig. 1E) so that styles are not visible in ventral view; if margin is not reflexed, styles are visible from below (Fig. 2F). Genitalia as in Figs 1J, 2G: hook on left side, with a subapical incision, median phallomere rodlike, apically acute.

Colouration. Yellowish to reddish brown. Hind wings with anterior field weakly yellowish, sometimes darker apically. Terminal abdominal segments sometimes darkly infuscated.

Measurements. Length, 17.0-23.0; pronotum length x width, 4.5-5.8 x 5.9-7.5; tegmen length, 16.5-24.0.

Female. Tegmina fully developed extending beyond end of abdomen, or reduced reaching to about T5-T8, rounded apically; in brachypterous individuals, wing venation is distinct (Fig. 1I), and eyes (Fig. 1B) are similar to those of males and macropterous females. Supraanal plate trigonal, reaching to hind margin of subgenital plate or slightly beyond.

Ootheca. Dark reddish brown, 4.1-4.3 mm high, 6.4-10.6 mm long, with 20-33 small keel serrations and 20-30 egg chambers; oothecal wall not covered by a removable membrane.

Measurements. Length, 16.4-22.8; pronotum length x width, 4.9-6.0 x 6.1-7.7; tegmen length, 11.0-14.2 (brachypterous), 16.5-21.5 (macropterous).

?VARIANTS (Figs 3A-H, 4A-D, 34)

MATERIAL EXAMINED

QUEENSLAND. QMBA: Braemar, S.E., via Kogan, SE Qld, 1 ♂, 15-19.x.1979, G.B. Monteith and QM; Hinchinbrook Is., NE Qld, Gayundah Ck, 10m, 1 ♂, 1 ♀, 7-15.xi.1984, Monteith, Cook and Thompson; 'Morney', 120 km W of Windorah, 2 ♂♂, 24.ix.1983, G.B. Monteith. ANIC: The Boulders, 5 km W of Babinda, 17.21S 145.52E, 1 ♂ (terminalia slide 65), 14-15.xi.1981, J. Balderson; 24 miles SW by W of Kingaroy, at light, 1 ♂ (terminalia slide 66), 21.xi.1968, Britton and Misko; Eidsvold, 1 ♂.

NEW SOUTH WALES. ANIC: 31 km WNW of Tenterfield, 28.58S 15.43E [*sic*: probably 151.43E], 1 ♂, 23.xi.1983, Stop 64; Lake Cowal, 1 ♂ (terminalia slide 62), 16.xii.1971, W. Vestjens; Willandra Bridge, 11 km N of Mossiel, dry swamp, at light, 33.16S 144.34E, 1 ♂ (terminalia slide 68), 21.xii.1970, Britton, Misko, and Pullen; Ararawarra, north coast, 1 ♂ (terminalia slide 75), at light, 7.xii.1961, C.W. Frazier.

SOUTH AUSTRALIA. ANIC: 2 km SW of Mt Barr, SSE of Abminga, 26.20S 134.56E, at light, 1 ♂ (terminalia

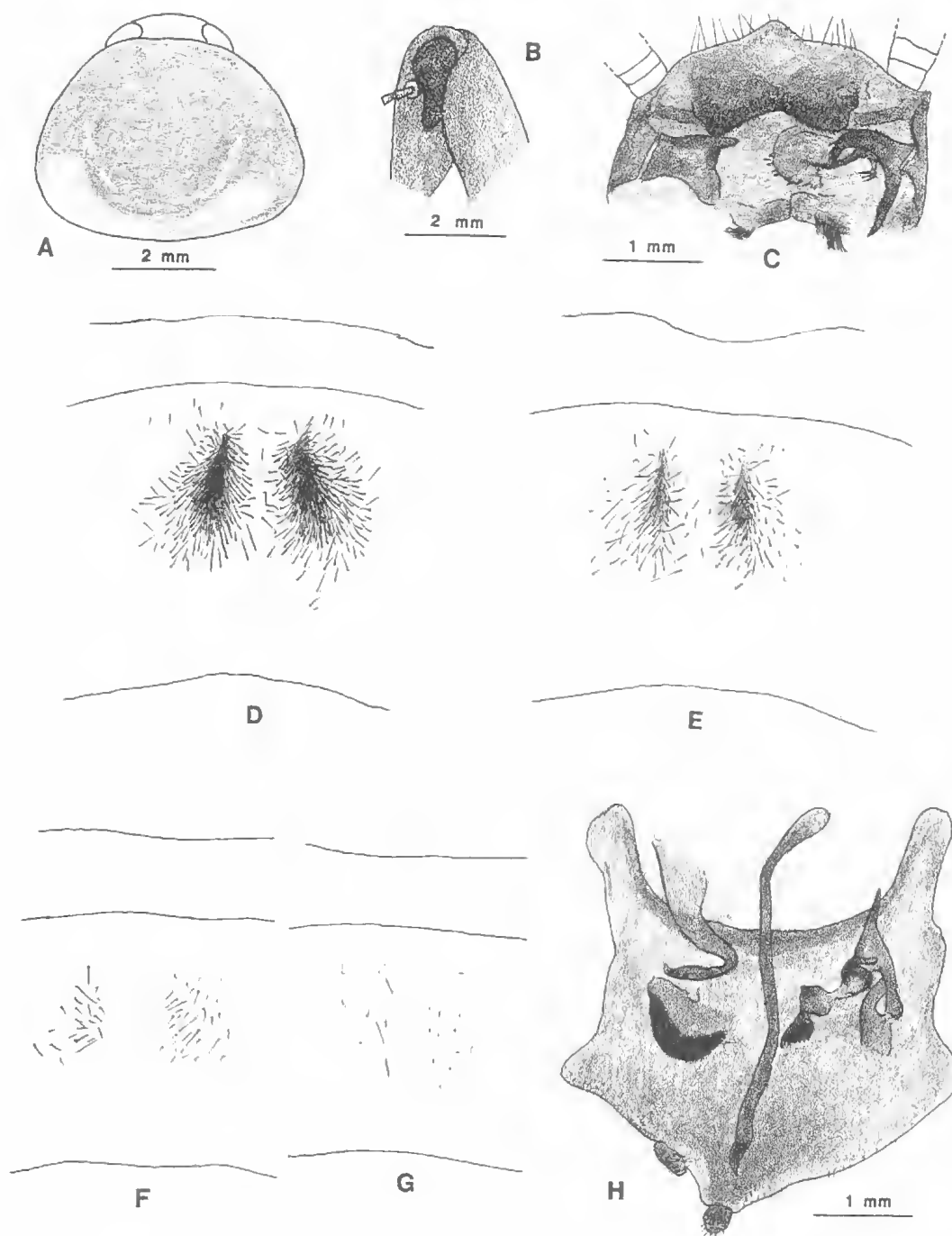


FIG. 3. *Neotemnopteryx ?fulva* (Saussure), variant. ♂♂: A, Pronotum; B, Eye (lateral view); C, Supraanal plate and paraprocts (ventral view); D-G, Setal glandular area on seventh abdominal tergum; H, Subgenital plate and genitalia (dorsal view). Localities: A, B, Tenterfield, N.S.W.; C, H, Lake Cowal, N.S.W.; D, The Boulders, Qld; E, 24 miles SW. by W. of Kingaroy, Qld; F, G, exact localities unknown.

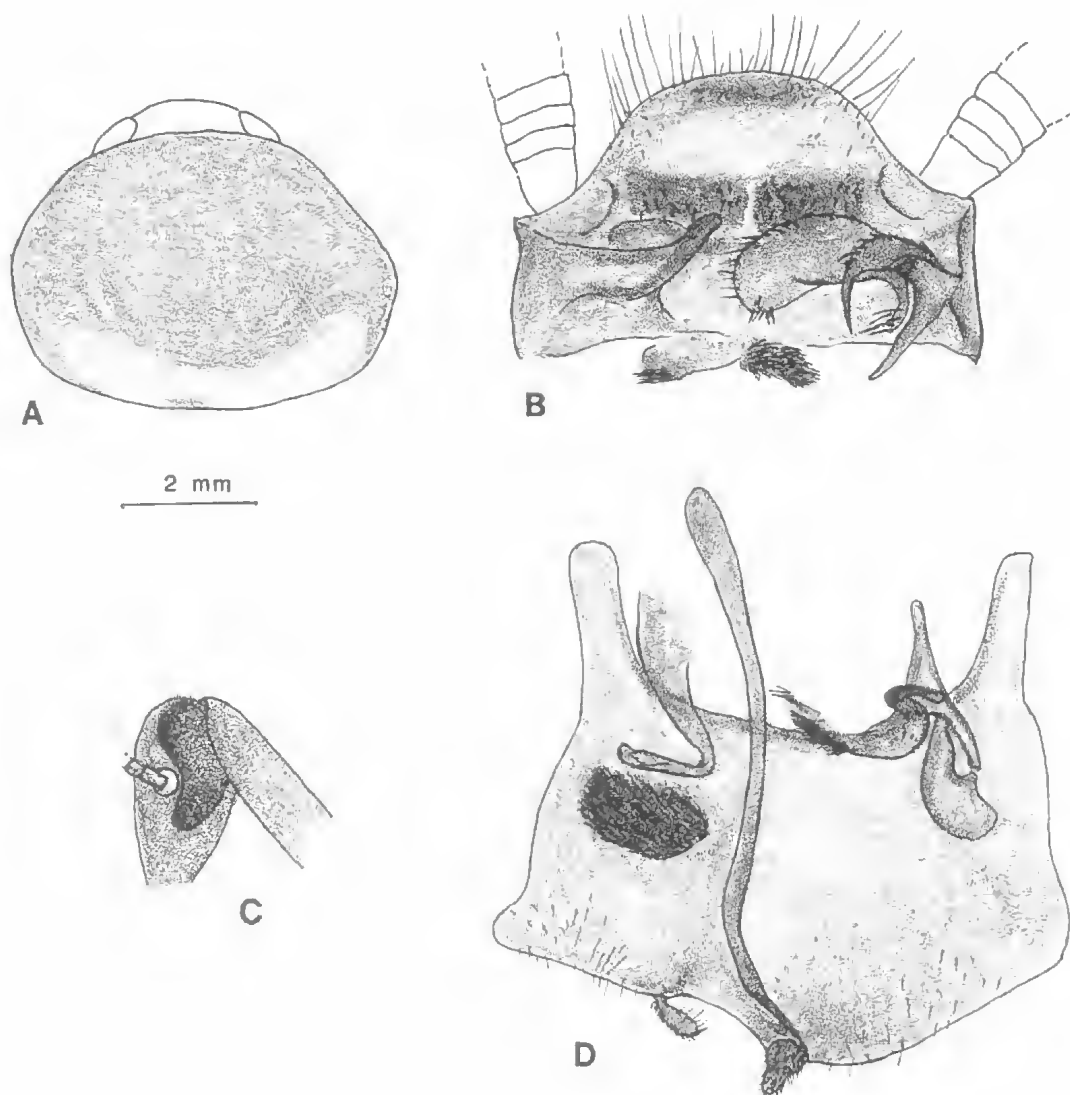


FIG. 4. *Neotemnopteryx? fulva* (Saussure), variant. ♂♂: A, Pronotum; B, Supraanal plate and paraprocts (dorsal view); C, Eye (lateral view); D, Subgenital plate and genitalia (dorsal view). Localities: A, C, Braemer, Qld; B, D, The Boulders, Qld.

slide 69), 25.ix.1972, K.H.L. Key *et al.* WAMP: Etadunna Sin, 1 ♂. x.1972, K. and B. Oldfield.

DESCRIPTION

A number of small specimens appear to be different from *fulva*, but in spite of their size I am provisionally considering them to be variants because their paraprocts and genital phallomeres are similar to what I believe to be that species. The hind margin of the supraanal plate may have a small medial protuberance (Fig. 3C, cp. Fig.

2D), or is rounded (Fig. 4B). The intercercal ridge may be divided (Fig. 4B, cp. Fig. 2D), or undivided and concave (Fig. 3C). The tergal gland on T7 varies from dense and distinct to sparse and subobsolete (Fig. 3D-G), or apparently absent. Because characters such as shape of hind margin of supraanal plate, intercercal ridge, and presence or absence of a gland on T7, which in some species are diagnostic, but here are so variable in the large number of specimens I have examined, I do not feel it advisable to describe a

new species. However, biological studies might show that more than one taxon is present among this material.

Measurements ($\delta\delta$). Length, 13.5-18.4; pronotum length x width, 3.4-4.7 x 4.7-6.0; tegmen length, 15.0-19.7.

REMARKS

Neotemnapteryx apicalis was synonymised by Kirby under *australis*, and by Princis under *fulva*. It is clearly not *australis*, as indicated by Princis (1969, p.730). Princis (1969) gave only Western Australia as the locality for *fulva*, and all his records (Princis, 1954, p.33) are from that state. Both Saussure and Walker simply indicated that their species, *fulva* and *apicalis*, came from Australia. The differences between the types of *apicalis* and *australis* (cp. Figs 1,2) are small and, based on examination of a large number of individuals, I consider them synonyms of *fulva*. As pointed out under remarks of the generic diagnosis, *Neotemnapteryx ferruginea* is based on a brachypterous specimen of *N. fulva*.

Collection data indicates that this is a common and widespread species occurring in ACT, NSW, Vict., SA, and WA.

Neotemnapteryx gloriosa n. sp. (Figs 5A-G,34)

MATERIAL EXAMINED

HOLOTYPE: δ , Mt Glorious, southeast Queensland, 2.i.1974, A. Hiller; in QMBA.

PARATYPES: QUEENSLAND: QMBA: Mt Glorious, 2 $\delta\delta$, 2.i.1974, 1 δ , 1 δ , 3.xii.1973, A. Hiller; Mt Misery, Shiptons Flat, via Cooktown, 1 δ , 2 $\delta\delta$, 1982, L. Roberts; Mt Chinghee, 12km southeast of Rathdowney, 1 δ , 17.xii.1982 (Rf, 720m), Monteith, Yeates and Thompson; Kroombit Tops (Upper Kroombit Ck), SSW Calliope, 1 δ , open forest, 9-19.xii.1983, G. Monteith and G. Thompson; Blackdown Tableland via Duaringa, C. Qld, 1 δ , 28-29.x.1980, G.B. Monteith; Mt Cannon summit via West Burleigh, SE Qld, rainforest, 1 δ , 1 δ , 18.i.1987, G. Monteith and D. Cook; Mt Moffat, N.P., Top shelter shed, 1000m, 1 δ , 10-12.x.1987, Top Moffat Camp, 1 δ , 13-15.xii.1987, Monteith, Thompson, Yeates. BPBM: Mt Glorious, 1 δ terminalia slide 453), 29.xi.1968, R. Rice. The following were collected by J.L. and M. Gressitt: Mt Glorious, Malaise trap, 6 $\delta\delta$ (1 with terminalia slide 452), 3 $\delta\delta$, 5-8.ii.1961, 1 δ , 3 $\delta\delta$, 13.ii.1961, sclerophyll forest, 1 δ , 13-16.ii.1961, rain forest, 1 δ , 24-28.ii.1961 (1 δ , 1 δ , retained at MCZH). ANIC: Brisbane, 1 δ , 13.ii.1960, C.F. Ashby; 2km NW of Mt Mowbray, Bunya Mtns,

light trap in *Nothofagus* forest, 3 $\delta\delta$, 6.i.1970, Britton, Holloway, and Misko; Binna Burra, Lamington Nat. Park, 1 δ (terminalia slide 86), 1 δ , 12.ii.1964.

NEW SOUTH WALES. BPBM: Ourimbah, 1 δ , i.1904. ANIC: Armidale, 1 δ , 26.xii.1959, 1 δ , at light, 1.ii.1960, C.W. Frazier; Allyn River, Chichester, S.F., 32.08S 151.27E, 1 δ , 10-11.xi.1981, T. Weir; Iluka N. Res., 4km N of Iluka, 1 δ , 21.xi.1982, J.T. Doyen; Plot Forest Road, 3km NNE of Minyon Falls, Whian Whian State Forest, NNE of Lismore, 28.35S 153.23E, 2 $\delta\delta$ (1 with terminalia slide 52), 17.xi.1982, D.C.F. Rentz and C.D. MacNeill. The following were collected by D.C.F. Rentz and M.S. Harvey: Sawpit Ck, 23km E of Woodenbong, 28.22S 152.51E, 5 $\delta\delta$, 22.xi.1983; Condong Falls, Whian Whian State Forest, NNE of Lismore 28.37S 153.23E, 1 δ , 1 δ , 18.xi.1983; Big Bend Flora Reserve, Gibbergunyah Rd, Whian Whian State Forest NNE of Lismore, 28.37S 153.19E, 1 δ , 19.xi.1983; Moore Park, Richmond R., 27km E by S of Woodenbong, 28.27S 152.54E, 1 δ , 21.xi.1983; The Bird Tree, Middle Brother State Forest, near Kendall, 31.41S 152.41E, 1 δ , 1 δ , 16.xi.1983. The following were collected by J.T. Doyen: Lake Cathie, 1 δ , 10-11.xi.1982; Cobcroft Camp, Werrikimbe Nat. Park, 1 δ , 12.xi.1982. The following were collected by H.M. Cameron: Mt Warning Nat. Park, near Murwillumbah, 1 δ , 10.viii.1979; Victoria Park near Alstonville, 1 δ , 6.vii.1981, 1 δ (with ootheca, reared from nymph, Feb. 1981). The following were collected by A. Calder: Gloucester R. Barrington Tops Nat. Pk, 32.04S 151.41E, 2 $\delta\delta$, 1 δ , 12-14.xi.1981; Wangaree S.F., 28.22S 153.05E, 1050m, 1 δ , 10-12.ii.1983 (coll. with T. Weir). DARA: Lane Cove, 5 $\delta\delta$, 14.xii.1977, G.R. Brown. AUSTRALIAN CAPITAL TERRITORY. ANIC: Canberra, CSIRO light trap, 1 δ , 4.ii.1953, I.F.B. Common.

DESCRIPTION

Male. Eyes extending below level of antennal sockets (Fig. 5C); interocular and intercellular distances similar; last palpal segment elongate. Pronotum as in Fig. 5A. Cubitus vein of hind wing with 5-6 complete and 4-7 incomplete branches, apical triangle subobsolete. Front femur Type A3; pulvilli present on 4 proximal tarsomeres, tarsal claws symmetrical, simple, arolia present. First, and seventh (Fig. 5D) abdominal terga specialised. Supraanal plate with posteromedial region deflexed, hind margin with small mesal convexity (Fig. 5B), or broadly, smoothly convex; intercercal ridge on ventral surface large, darkly sclerotised, divided, covered with minute setae; right and left paraprocts with elongated spinelike processes, right one covered with small setae (Fig. 5B).

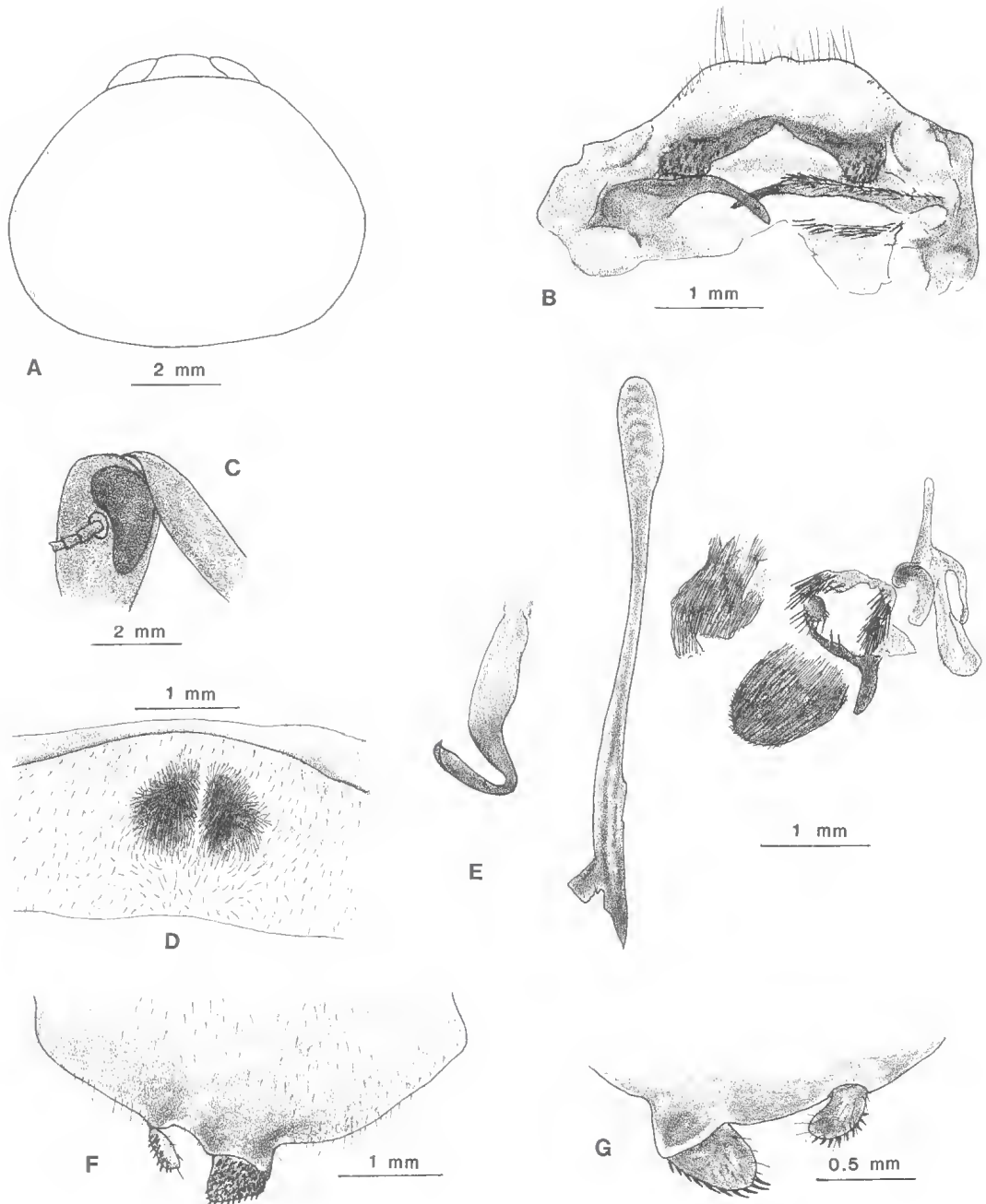


FIG. 5. *Neotemnopteryx gloriosa*, n. sp. ♂ paratypes: A, Pronotum; B, Supraanal plate and paraprocts (ventral view); C, Eye (lateral view); D, Setal gland on seventh abdominal tergum; E, Genitalia (dorsal view) F, Distal region of subgenital plate showing styles (dorsal view); G, Styles (ventral view). Localities: A-F, Mt Glorious, Qld, G, Condong Falls, N.S.W.

Right style at apex of subgenital plate, much more robust than left cylindrical one, both covered with small spines (Fig. 5F,G). Genitalia as in Fig. 5E: hook on left side with subapical incision, median phallomere, apically acute, with preapical square-shaped extension on one side.

Colouration. Chestnut brown. Antennae uniformly pale or first two segments light, remainder dark brown. Pronotum with posterolateral and hind border regions ranging from practically opaque to variably translucent. Supraanal plate with dark brown medial region on posterior half. Cerci dark brown. Hind wing yellowish brown, distal region may be darker. Specimens from New South Wales may have broad dark brown lateral border on venter, with a dark subgenital plate.

Female. Supraanal plate broadly trigonal, apex acute or subacute. Supraanal plate may be darkly infuscated in New South Wales specimens; dark brown lateral borders of abdominal sterna, and dark subgenital plate are more extensive and intense than in males.

Measurements (♀ in parentheses). Length, 19.0-25.5 (19.0-26.2); pronotum length x width, 5.0-6.3 x 6.3-8.3 (5.1-6.4 x 6.0-8.2); tegmen length, 22.3-27.8 (19.0-26.6).

REMARKS

There is considerable variation in size in this species. Specimens from Mt Glorious tend to be larger than those from New South Wales.

Neotemnopteryx australis (Saussure) n. comb. (Figs 6A-E, 34)

Ischnoptera australis Saussure, 1863, p. 155, pl. 1, fig. 17 (♂).

Symploce fulva (nec Saussure, 1863): Princis, 1951, p. 59, pl. 6, figs 61, 62 (♂ and ♀) (misidentification).

Gislenia australis (Saussure): Princis, 1954, p. 34; 1969, p. 730.

MATERIAL EXAMINED

LECTOTYPE (here designated): ♂, Australia; in MHGN. (I received 4 specimens, supposedly of *Ischnoptera australis* Saussure, from the Neuchâtel Museum. These were Saussure's specimens but were not individually labelled and were arranged in the collection under the above name. One was '*Ischnoptera*' *australis* which I am designating the lectotype of *Neotemnopteryx australis*. Of the other 3 specimens, one is a male of an *Ischnoptera*, having the typical specialisations on abdominal terga 7 and 8; the

other 2 specimens are females and probably belong in *Ischnoptera* based on their wing venation and Type B₃ front femurs. *Ischnoptera* is found principally in South America and does not occur in Australia. Saussure described several species from South America, and the 3 specimens probably were incorrectly arranged in the Museum collection).

AUSTRALIAN CAPITAL TERRITORY. ANIC: Canberra, CSIRO light trap, 2♂♂, 12.iv.1953, P.J. Sinclair; Black Mt., light trap, 1♂ (terminalia slide 51), 15.xii.1968, 1♂, 8.i.1969, I.F.B. Common.

NEW SOUTH WALES. ANIC: 16 miles E of Bungendore, 1♂, 18.xii.1951, H.M. Cane; 13km ENE of Kyogle, 28.35S 153.08E, 1♀, 20.xi.1983, D.C.F. Rentz and M.S. Harvey; Durras North, nr Batemans Bay, 1♀ (with detached ootheca), 16.i.1985, H.M. Cameron.

DESCRIPTION

Male. Eyes extending below level of antennal sockets (Fig. 6D), interocular width about same as distance between ocellar spots, less than space between antennal sockets. Pronotum with pair of shallow oblique impressions on distal half, lateral margins truncate, oblique, on posterior half, hind margin weakly convex, posterior region mostly hyaline (Fig. 6A). Abdominal terga 1 and 7 with large dense medial tufts of setae, those on the latter segment (Fig. 6C) partly hidden by T6. Supraanal plate subtrapezoidal (Fig. 6B); intercereal ridge absent, represented by few, robust, minute spines; some small to minute spicules along hind margin and posterior halves of lateral margins of plate; left paraproct with slender surface setae, posterodistal corner prolonged into robust sclerotised spine, right paraproct with large, single, curved, spine-like process, robust and slender setae on other regions of sclerite (Fig. 6B). Subgenital plate with exposed region trigonal, convex, large right style at its apex, the smaller left style separated from it by more than its length, both with surface spines (Fig. 6E). Genital phallomeres as in Fig. 6E: genital hook on left side, hardly any neck between hook portion and broad basal arm, former uniformly slender, apex slightly enlarged without subapical incision; median phallomere rodlike, apex acute, right phallomere with cleft sclerite.

Colouration. Yellowish brown.

Female. Supraanal plate trigonal, sides not concave, apex rounded, reaching about hind margin of subgenital plate. Pronotum as in male. Ootheca black, microscopically roughened, individual egg cells not discernible. keel with 24

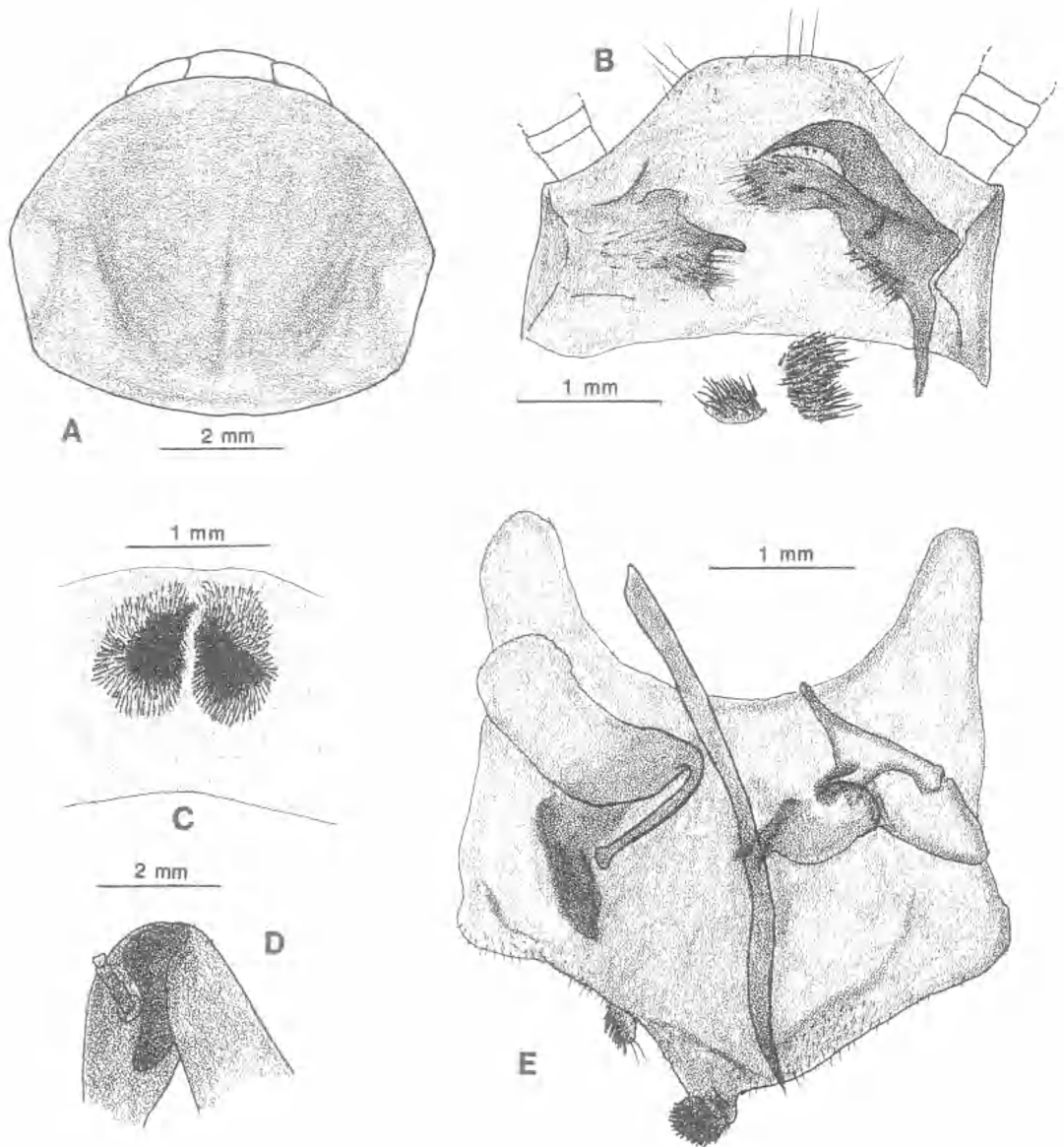
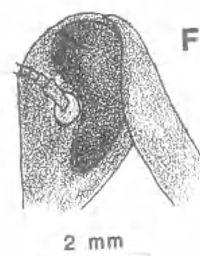
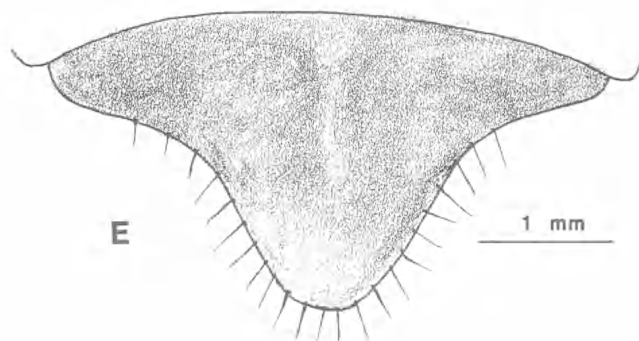
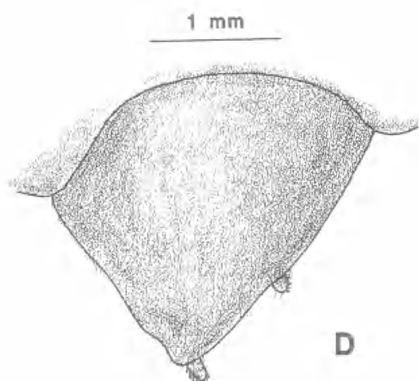
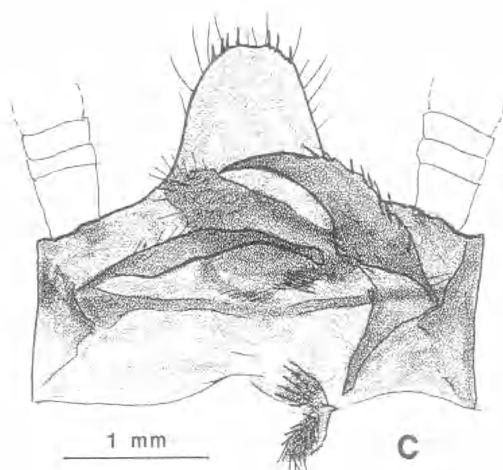
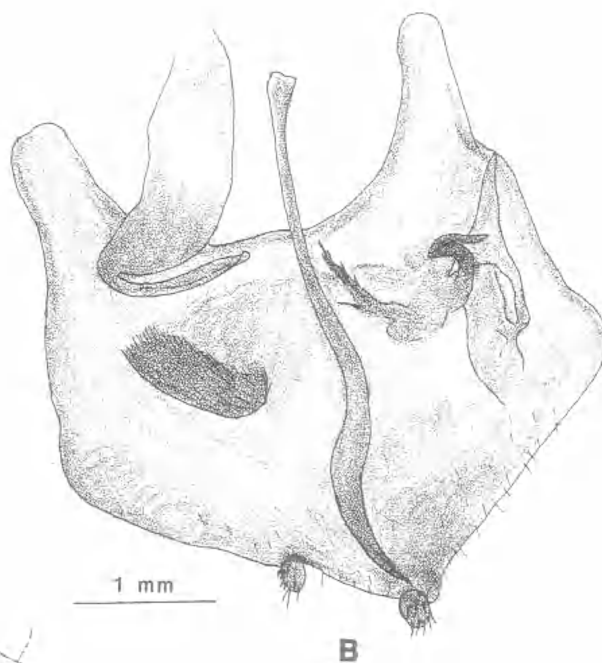
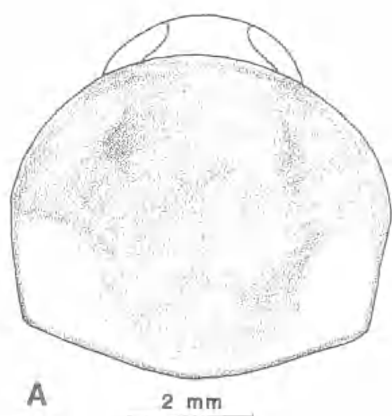


FIG. 6. *Neotemnapteryx australis* (Saussure). ♂♂: A, Pronotum; B, Supraanal plate and paraprocts (ventral view); C, Setal gland on seventh abdominal tergum; D, Eye (lateral view); E, Subgenital plate and genitalia (dorsal view). Localities: A-C, E, Black Mt., A.C.T.; D, Canberra, A.C.T.

FIG. 7. *Neotemnapteryx glossa*, n. sp. A-D, F, ♂ Holotype: A, Pronotum; B, Subgenital plate and genitalia (dorsal view); C, Supraanal plate and paraprocts (ventral view); D, Subgenital plate and styles (ventral view); E, Female paratype from 'Baren Grounds', southeast of Robertson, N.S.W., supraanal plate (dorsal view); F, Eye (lateral view).



shallow, undulate teeth; 4.0mm high, 7.6mm long.

Measurements (♀ in parentheses): Length, 20.5-23.0 (19.6-21.4); pronotum length x width, 4.8-5.6 x 6.3-7.2 (5.2-6.1 x 6.7-7.3); tegmen length, 24.0-25.0 (22.4).

Neotemnapteryx glossa n. sp.
(Figs 7A-F, 34)

MATERIAL EXAMINED

HOLOTYPE: ♂ (terminalia slide 61), Jolly Flora Res., 17km N of Dorrigo, New South Wales, 15.xi.1982, J.T. Doyen; in ANIC.

PARATYPES: NEW SOUTH WALES. ANIC: 'Barren grounds', SE of Robertson, 1 ♀, 29.xii.1974, K.H.L. Key; Armidale, at light, 1 ♀, 27.i.1963, C.W. Frazier; Durras North, near Batemans Bay, 1 ♀ (with ootheca), 16.i.1985, H.M. Cameron.

ADDITIONAL MATERIAL

QUEENSLAND. QMBA: Mt Moffat N.P., C. Old, Mahogany Forest, 1000m, 1 ♀, 11-12.xii.1987, Monteith, Thompson, Yeates.

ETYMOLOGY

The specific name refers to the male's tongue-shaped supraanal plate.

DESCRIPTION

Male. Eyes extending well below antennal sockets (Fig. 7F), interocular distance about same as interocellar space, less than space between antennal sockets. Pronotum with posterior half of lateral margins straight, weakly oblique, margin of anterior half convexly rounded, disk with pair of shallow oblique grooves on posterior half (Fig. 7A). First and seventh abdominal terga with large, dense, groups of setal tufts. Supraanal plate with concave sides, produced, tongue-shaped, margins incrassate with small dark spines apically on each side of midline; paraprocts dissimilar, right one larger, spinelike; intercercal ridge present as a pair of pale plates hidden under paraprocts (Fig. 7C). Subgenital plate trigonal, convex, styles small, right one slightly more robust, located at apex of plate (Fig. 7B,D). Genitalia as in Fig. 7B: hook on left side, distal portion slender with subapical incision, basal arm portion broad, neck region absent; median phallomere rodlike, enlarged distally, tapering to weakly divided, acute apex; right phallomere with cleft.

Colouration. Yellowish brown.

Female. Supraanal plate less concave than in

male, apex rounded (Fig. 7E). Cubitus vein of hind wing with 5 complete and 3-5 (1 bifurcate) incomplete branches, apical triangle subobsolete. Hind wing with anterior field infuscated. The ootheca is blackish, surface microscopically roughened, keel undulate with 26 shallow rounded teeth; 4mm high, 7.8mm long.

Measurements (♀ in parentheses). Length, 21.0 (21.5); pronotum length x width, 5.3 x 6.4 (5.9 x 7.1); tegmen length, 24.7 (25.0).

REMARKS

The shape of the pronotum is similar in *glossa* and *australis* and the differences in the male genitalia are small. The males are easily separated by the shapes of the supraanal plate, and styles. The supraanal plate of female *australis* is more triangular than that of *glossa*. The female record of *glossa* from Mt Moffat, Qld, should be confirmed by examining males.

Neotemnapteryx bifurcata n. sp.
(Figs 8A-G, 34)

MATERIAL EXAMINED

HOLOTYPE: ♂, Emu Ck, 27km of SW of Dimbulah, Queensland, 17.20S 144.57E, 25-26.xi.1981, J. Balderson; in ANIC.

PARATYPES: QUEENSLAND. QMBA: Bellenden Ker Range, Cableway Base Stn, 100m, Malaise trap in rainforest, 1 ♂ (terminalia slide 52), 25-31.x.1981, Earthwatch/QM. ANIC: Crystal Ck, 23 miles SSE of Ingham, 18.58S 146.16E, 1 ♂ (terminalia slide 63), 9.xii.1968, Britton and Misko; 6km SE of Chillagoe, 17.12S 144.33E, 1 ♂, 26.xi.1981, J. Balderson; Ewan Road, 3-14 miles W of Paluma, 1 ♂, 4-6.i.1966, J.G. Brooks; Mt Spec, Paluma Ra., 1 ♂, 5-7.i.1965, J.G. Brooks; Cunningham's Gap, McPherson Ra., Qld, 1 ♂ (terminalia slide 177), 3-4.xii.1982, G. Theischinger. AUSTRALIAN CAPITAL TERRITORY. ANIC: Black Mt, light trap, 1 ♂, (terminalia slide 58), 25.i.1966, 1 ♂, 24.xii.1962, I.F.B. Common.

ETYMOLOGY

The specific name refers to the bifurcated apex of the male's median genital phallomere.

DESCRIPTION

Male. Eyes extending below antennal sockets (Fig. 8B), interocular width greater than distance between ocellar spots. Pronotum suboval (Fig. 8A), lateral and posterior regions transparent. Cubitus vein of hind wing with 4-5 complete and 2-3 incomplete branches, apical triangle small or

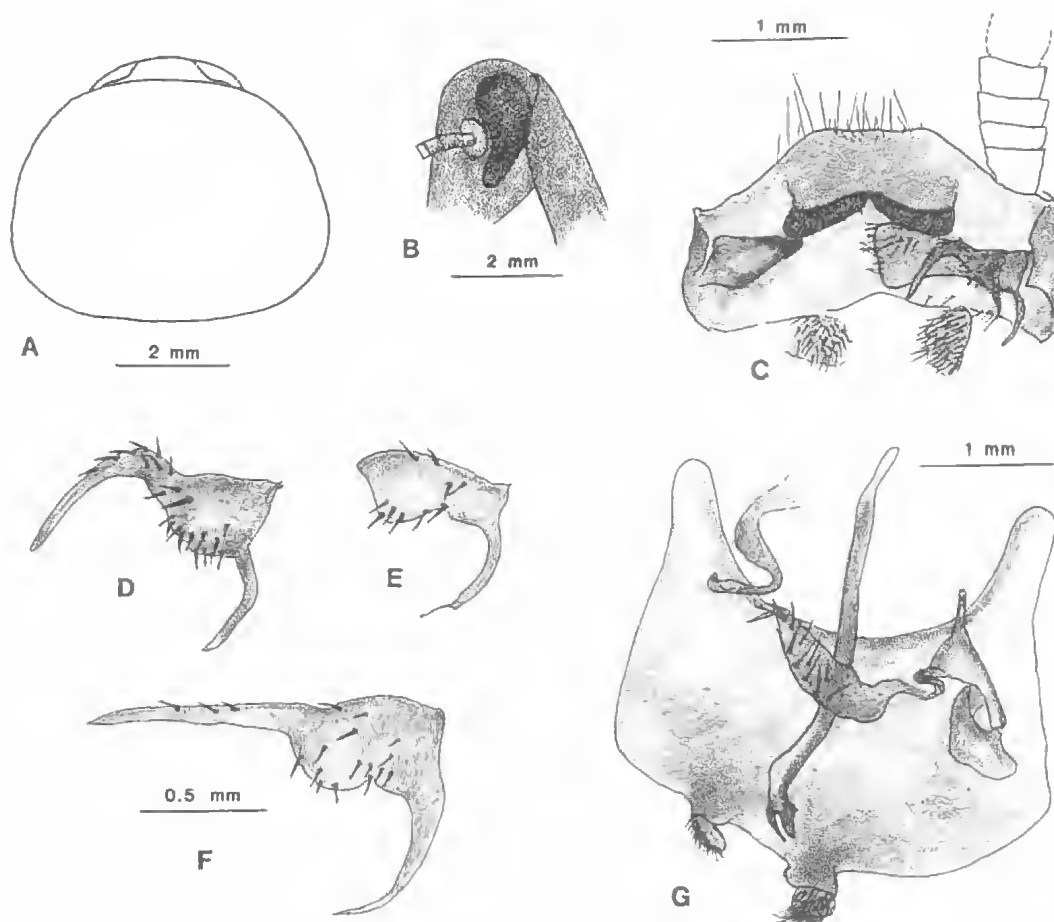


FIG. 8. *Neotemnopteryx bifurcata*, n. sp. ♂♂. A, B, Holotype, pronotum, and eye (lateral view); C-G, Paratypes: C, Supraanal plate and paraprocts (ventral view); D-F, Variation in right paraprocts (ventral views); G, Subgenital plate and genitalia (dorsal view). Localities: A, B, Emu Ck, Qld; C, D, Crystal Ck, Qld; E, Bellenden Ker Range, Qld; F, Black Mt., A.C.T.; G, Crystal Ck, Qld.

subobsolete. Front femur Type A₃; pulvilli present on 4 proximal tarsomeres, tarsal claws simple, symmetrical, arolia very small. First abdominal tergum with a pair of dense setal tufts anteromedially. Seventh abdominal tergum unspecialised. Supraanal plate transverse, trapezoidal, midposterior region weakly depressed so margin appears undulate or concave in pinned specimen; intercercal ridge darkly sclerotised and spined on free border; paraprocts dissimilar, right one variable, with or without a straight, or curved spinelike process (Fig. 8C-F). Subgenital plate with dissimilar styles, right one more robust, at apex of plate, both with small dark spines, interstyler region membranous, less

sclerotised (Fig. 8G). Genitalia as in Fig. 8G: hook on left side, with a subapical incision; median phallomere rodlike, apex divided (the bifurcation is visible in pinned specimens if the supraanal and subgenital plates are separated).

Colouration. Light brown. Hind wing with distal region of anterior field darker.

Female. See variant.

Measurements (ACT specimens in parentheses). Length, 15.0-18.1 (20.0-23.0); pronotum length x width, 4.1-5.0 x 5.1-6.0 (5.1-5.4 x 6.3-6.7); tegmen length, 17.3-19.0 (23.3-24.0).

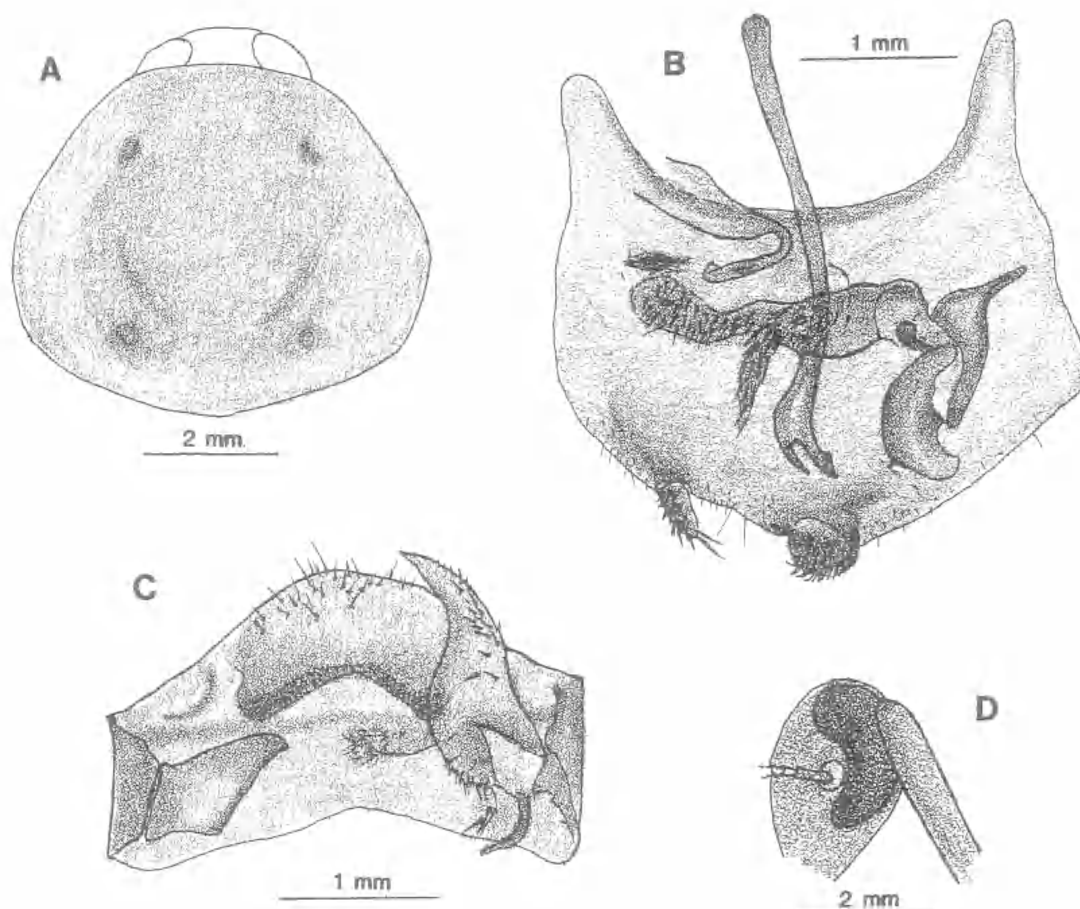


FIG. 9. *Neotemnapteryx bifurcata*, n. sp., ♂ variant from Broken River, Qld, 50 miles west of Mackay: A, Pronotum; B, Subgenital plate and genitalia (dorsal view); C, Supraanal plate and paraprocts (ventral view); D, Eye (lateral view).

VARIANT (Figs 9A-D, 34)

MATERIAL EXAMINED

QUEENSLAND. ANIC: Broken River, 50 miles west of Mackay, 1 ♂ (terminalia slide 67), 1 ♀, at light, rain forest, 29.xi.1968. Britton and Misko; Coomingleh St. For., 22km NW of Monto, 1 ♂ (terminalia slide 73), 23.xii.1982. J.T. Doyen.

DESCRIPTION

Male. Eyes extending below level of antennal sockets (Fig. 9D); interocular and interocellar distances similar. Pronotum (Fig. 9A) with lateral portions opaque or hyaline. Cubitus vein of hind wing with 4-5 complete (1 bifurcate), and 4 incomplete branches, apical triangle subobsolete. Front femur Type A₃; pulvilli on 4

proximal tarsomeres, tarsal claws symmetrical, simple, arolia small. First abdominal tergum with a pair of dense setal tufts anteromedially. Seventh abdominal tergum unspecialised. Supraanal plate with hind margin convexly rounded, intercercal ridge on ventral surface deeply concave, minute spines on free border; right paraproct large, broad, robust (Fig. 9C). Subgenital plate with robust right style at apex, left style more slender, cylindrical, both covered with small spines (Fig. 9B). Genitalia as in Fig. 9B.

Colouration. Light brown. Anterior field of hind wing light brown, darker distally.

Female. Cubitus vein of hind wing with 6 complete and 5 (1 bifurcate) incomplete

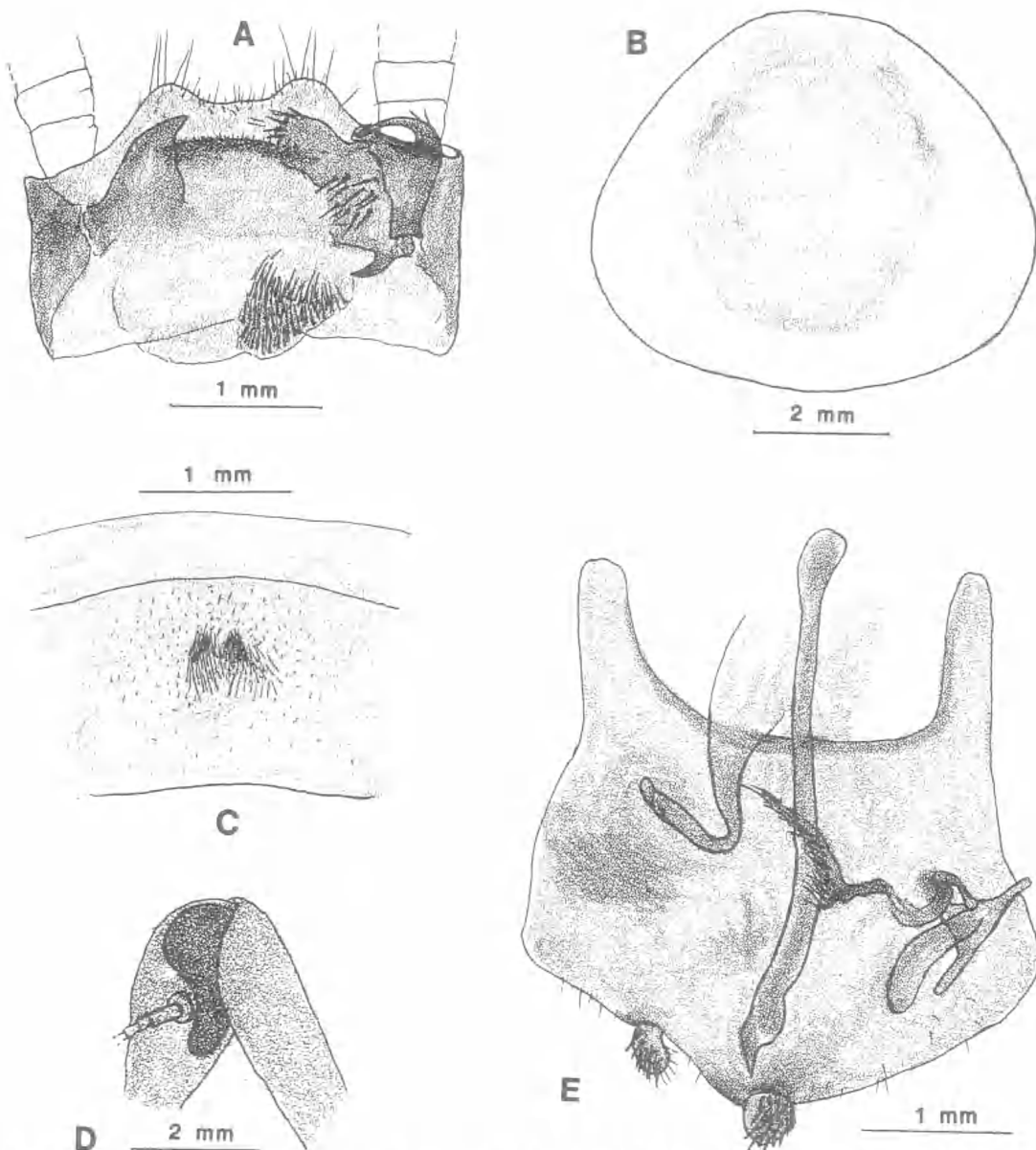


FIG. 10. *Neotemnopteryx concava*, n. sp., ♂ paratype from same locality as holotype: A, Supraanal plate and paraprocts (ventral view); B, Pronotum; C, Setal gland on seventh abdominal tergum; D, Eye (lateral view); E, Subgenital plate and genitalia (dorsal view).

branches. Supraanal plate trigonal, apex extending slightly beyond hind margin of subgenital plate.

Measurements (♀ in parentheses). Length, 18.7-19.2 (23.0); pronotum length x width, 5.0-5.2 x 6.0-6.5 (5.6 x 6.9); tegmen length, 21.4-22.8 (24.7).

REMARKS

There are some differences between the variant and the typical specimens in shape of pronotum, hind margin of supraanal plate, and intercercal ridge. The most striking difference is in the shape of the male's right paraproct. However, the right paraproct of the typical morph is variable (Fig. 8D-F). Slenderization of the more robust right

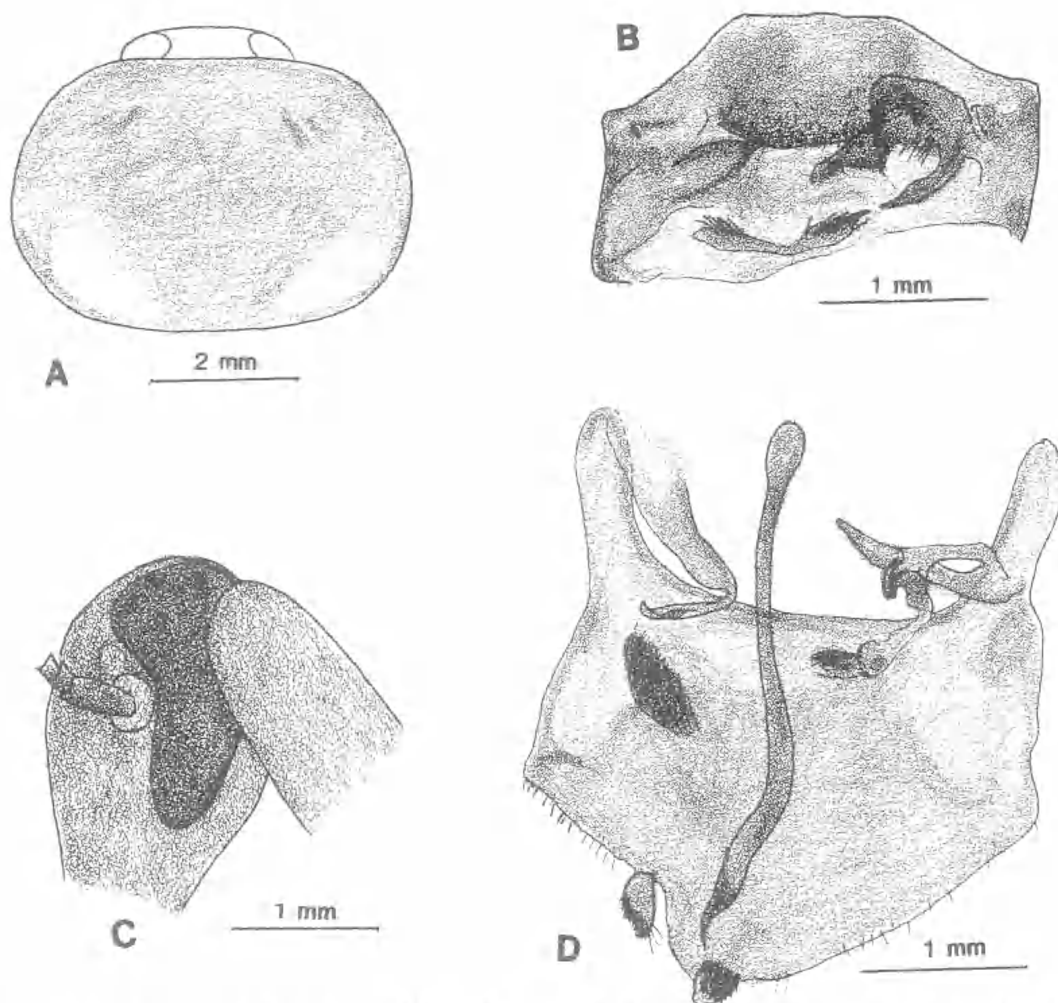


FIG. 11. *Neotemnapteryx elliptica*, n. sp. ♂♂: A, Pronotum; B, Supraanal plate and paraprocts (ventral view); C, Eye (lateral view); D, Subgenital plate and genitalia (dorsal view). C, from holotype, A, B, D, paratype from same locality as holotype.

paraproct of the variant (Fig. 9C) could result in a structure similar to that shown in Fig. 8D or F. If additional collecting and study shows no intermediate forms between the variant and typical morphs then the former may prove to be a distinct taxon.

***Neotemnapteryx concava* n. sp.**
(Figs 10A-E, 34)

MATERIAL EXAMINED

HOLOTYPE: ♂, Plot Forest Road, 3km NNE of Minyon Falls, Whian Whian State Forest, NNE of Lismore, New South Wales, 28.35S 153.23E, Stop 93,

17.xi.1982, D.C.F. Rentz and C.D. MacNeill; in ANIC.

PARATYPES: NEW SOUTH WALES. ANIC: same data as holotype, 1♂ (terminalia slide 64); Federal, near Dorrigo, 1♂, 26.xi.-8.xii.1985, H.M. Cameron. DARA: Baulkham Hills, 1♂, 5.xi.1977, B.E. Wallbank. BPBM: Harwood Island, 1♂, 28.i.1967, C. Ryan, MCZH: Wentworth Falls, 2800ft, 1♂, 23.xii.1931, P.J. Darlington, Harvard Australian Exp. QUEENSLAND. BPBM: Brisbane, 1♂, 30.ix.1967, B. Bonnie.

WESTERN AUSTRALIA. WAMP: Bunington Spring (well), 31.26S, 123.33E, 1♂, light trap, 18-25.xi.1978, T.F. Houston *et al.*

ADDITIONAL MATERIAL

NEW SOUTH WALES. ANIC: Willoughby, 1 ♀, 8.i.1950, K.G. Campbell.

QUEENSLAND. BPBM; Mt Glorious, 1 ♀, 13.ii.1961, L. and M. Gressitt.

ETYMOLOGY

The specific name refers to the concave excavation of the hind margin of the male's supraanal plate.

DESCRIPTION

Male. Eyes extending below level of antennal sockets (Fig. 10D), interocular and interocellar distances about same, less than space between antennal sockets. Pronotum suboval (Fig. 10B), posterolateral and hind border regions transparent. Cubitus vein of hind wing with 5 complete and 3-4 incomplete branches. Front femur Type A3; pulvilli on 4 proximal tarsomeres, tarsal claws simple, symmetrical, arolia small. First and seventh abdominal terga specialised, setae on T1 numerous, dense, dark, those on T7 (which is hardly depressed medially) pale, fewer, less dense and difficult to see (Fig. 10C). Supraanal plate with hind margin broadly concavely excavated, corners rounded; right and left paraprocts dissimilar, former with a spinelike process and setal plate; intercercal ridge present, free margin convex, with small spines (Fig. 10A). Subgenital plate broadly trigonal, right style at its apex, more robust than the left one (Fig. 10E). Genitalia as in Fig. 10E; hook on left side with a subapical incision, rodlike median phallomere apically acute, right phallomere with visible cleft.

Colouration. Yellowish brown. Hind wings with veins and distal region of anterior field, yellowish.

Measurements. Length, 16.3-22.0; pronotum length x width, 4.2-5.2 x 5.0-6.5; tegmen length, 18.5-23.3.

Female. I am provisionally placing 2 females listed above, here, pending finding males in the same localities (Willoughby, NSW, and Mt Glorious, Qld). The supraanal plate is trigonal and its apex is shallowly, but distinctly excavated.

Measurements. Length, 16.7-18.0; pronotum length x width, 4.8-5.2 x 5.9-6.3; tegmen length, 17.7-18.5.

REMARKS

The shape of the hind margin of the male's supraanal plate is distinctive, as is the apically

indented apex of the female's plate. The smallest male came from Harwood Island.

Neotemnapteryx elliptica n. sp.
(Figs 11A-D, 34)

MATERIAL EXAMINED

HOLOTYPE: ♂, at light, 3 miles N of Eromanga, Queensland, 3.xi.1967, R.C. Lewis; in ANIC.

PARATYPES. QUEENSLAND. ANIC: same data as holotype, 1 ♂ (terminalia slide 60); 62km W by S of Boulia, 23.02S 139.18E, 1 ♂, 16.x.1978, M.S. Upton.

NORTHERN TERRITORY. ANIC: 'Newcastle Waters', 1 ♂, 1.vi.1929, T.G. Campbell.

ETYMOLOGY

The specific name refers to the shape of the pronotum.

DESCRIPTION

Male. Eyes very well developed extending well below level of antennal sockets (Fig. 11C), interocular space slightly greater than interocellar width, about same as distance between antennal sockets. Pronotum essentially elliptical, greatest width at about middle (Fig. 11A). Hind wing with median vein bifurcate distad; cubitus vein with 3-4 complete and 3-4 incomplete branches, apical triangle absent. Front femur Type A3; pulvilli present on 4 proximal tarsomeres, tarsal claws symmetrical, simple, arolia present. First abdominal tergum with a dense, medial, setal tuft. Seventh abdominal tergum unspecialised. Supraanal plate trapezoidal (Fig. 11B), hind margin deflexed medially, not extending beyond hind margin of subgenital plate; intercercal ridge large, pale or darkly sclerotised, with or without a medial indentation, and with dense group of small spines on rounded free margin; paraprocts dissimilar, right one with a robust, curved, apically acute process (Fig. 11B). Subgenital plate trigonal, apex bearing a small knoblike right style, left style slightly longer, both with some small dark spines (Fig. 11D). Genitalia as in Fig. 11D; hook on left side with a subapical incision, basal arm slightly wider than hook portion; median phallomere with an acute, darkly sclerotised apex; right phallomere with a reduced cleft sclerite.

Colouration. Light brown.

Female. Unknown.

Measurements. Length, 15.6-16.4; pronotum length x width, 3.8-4.0 x 5.1-6.0; tegmen length, 16.5-18.3.

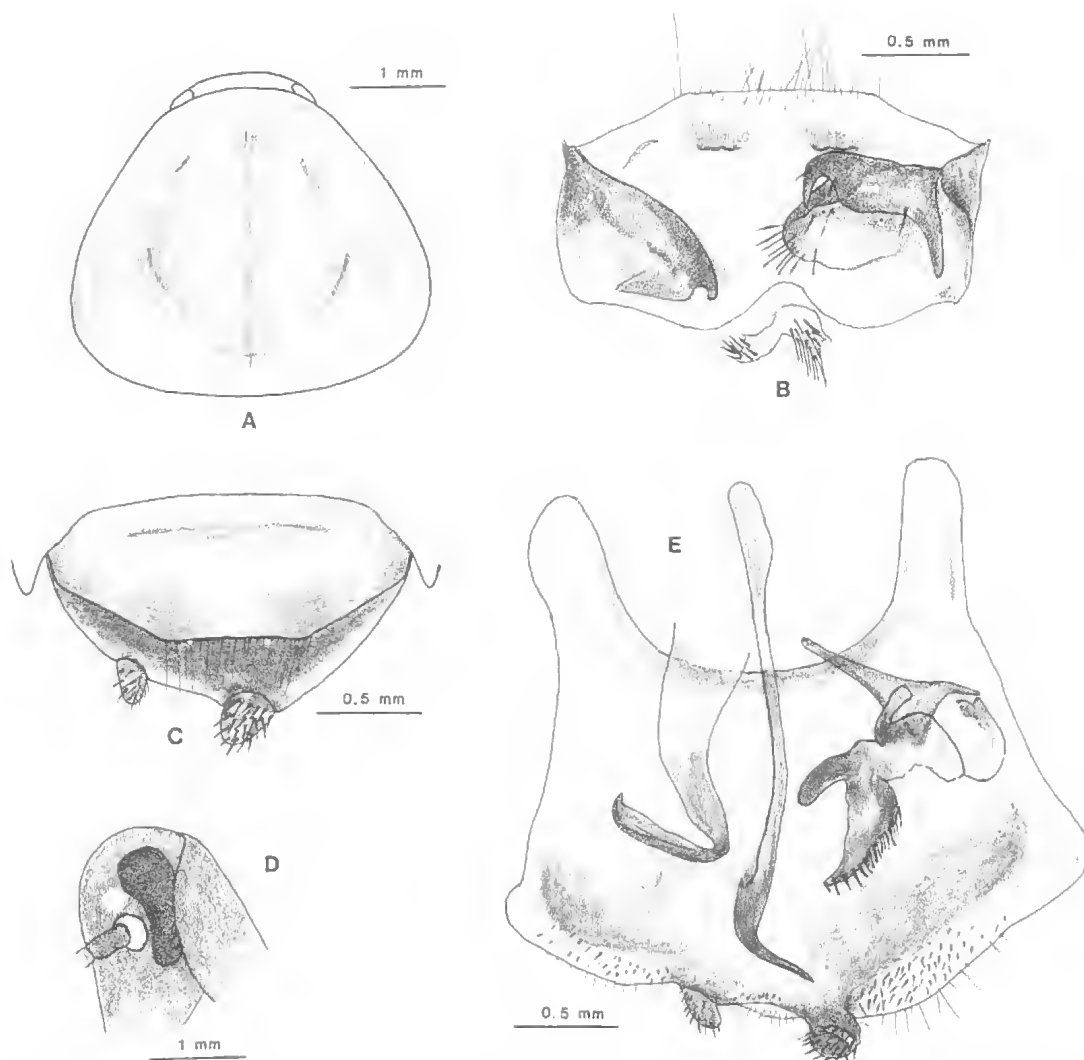


FIG. 12. *Neotemnapteryx nana*, n. sp. ♂ holotype: A, Pronotum; B, Supraanal plate and paraprocts (ventral view); C, Supraanal and subgenital plates (dorsal view); D, Eye (lateral view); E, Subgenital plate and genitalia (dorsal view).

***Neotemnapteryx nana* n. sp.**
(Figs 12A-E, 34)

MATERIAL EXAMINED

HOLOTYPE: ♂ (terminalia slide 51), Braemar S.F., via Kogan, SE Queensland, 15-19.x.1979, G.B. Monteith and QM; in QMBA.

ETYMOLOGY

The specific name refers to the small size of the species.

DESCRIPTION

Male. Eyes somewhat reduced extending slightly below level of antennal sockets (Fig. 12D), interocular space distinctly greater than interocellar space. Pronotum subparabolic (Fig. 12A), sides deflexed, posterolateral and hind border regions transparent. Cubitus vein of hind wing with 2 (1 bifurcate) or 3 complete, and 3 incomplete branches. Front femur Type A3; pulvilli on 4 proximal tarsomeres, tarsal claws symmetrical, simple, arolia present. First abdominal tergum with large setal specialisation. Seventh

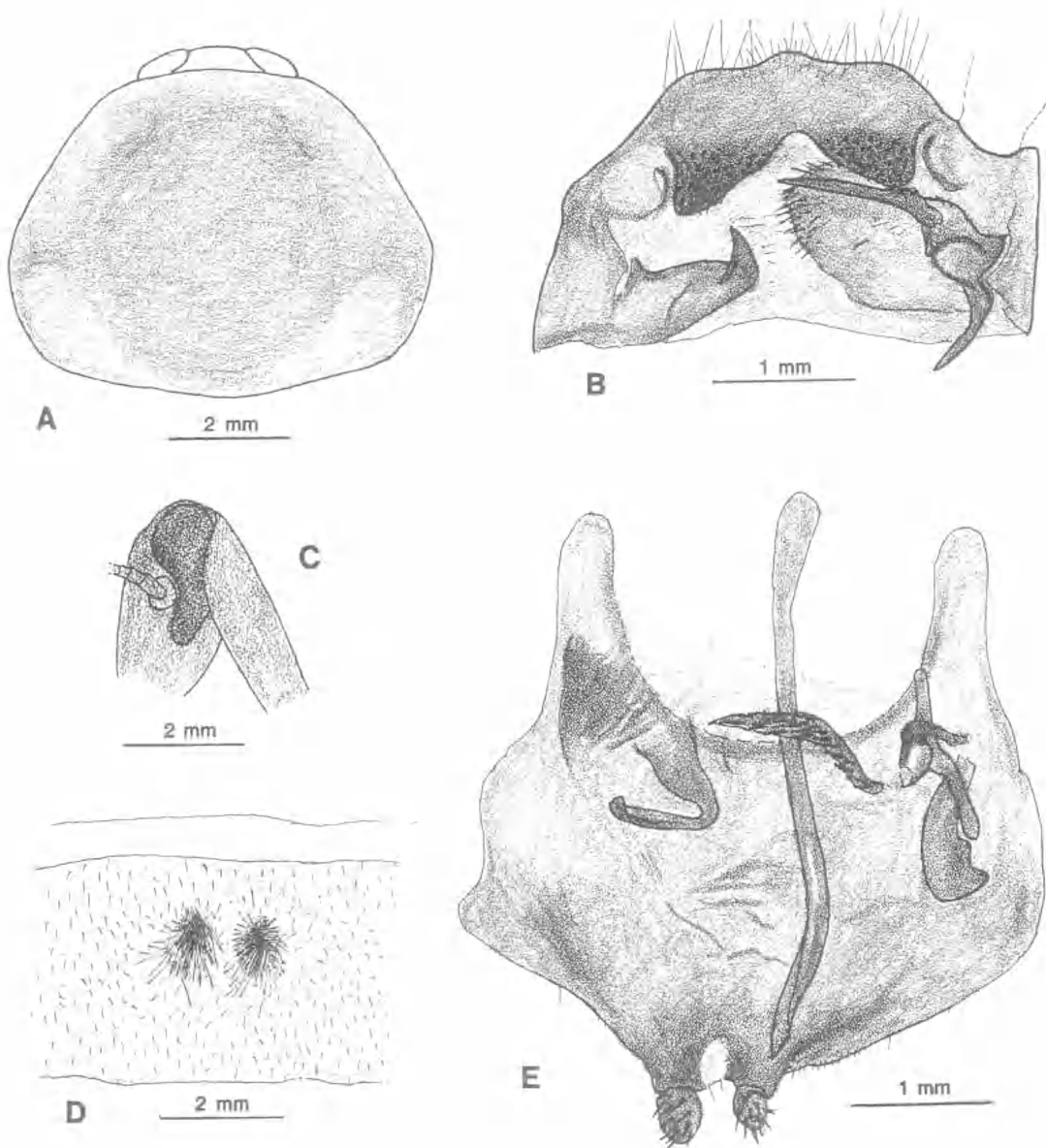


FIG. 13. *Neotemnopteryx stylipareda*, n. sp. ♂♂: A, Pronotum; B, Supraanal plate and paraprocts (ventral view); C, Eye (lateral view); D, Setal gland on seventh abdominal tergum; E, Subgenital plate and genitalia. Localities: A, C, Holotype, Wongabel State Forest, Qld; B, D, E, Paratype, 21 km south of Atherton, Qld.

abdominal tergum unspecialised. Supraanal plate transverse, trapezoidal, with horizontal groove on anterior half, hind margin not reaching hind margin of subgenital plate (Fig. 12C); intercercal ridge practically obsolete, repre-

sented by pair of thin, lightly sclerotised plates with only a few minute spicules; right and left paraprocts are dissimilar (Fig. 12B). Subgenital plate broadly asymmetrically rounded, right style stouter than left one (Fig. 12C,E). Genitalia

as in Fig. 12E: hook on left side; median phallomere with curved, darkly sclerotised acute apex; right phallomere with cleft sclerite.

Colouration. Head brownish between eyes and medially on face, cheeks pale. Pronotum yellowish brown. Tegmina and wings dark brown.

Female. Unknown.

Measurements. Length, 12.5; pronotum length x width, 3.4 x 3.8; tegmen length, 14.7.

REMARKS

This is the smallest known species of *Neotemnopteryx*.

Neotemnopteryx styliparedra n. sp. (Figs 13A-E, 34)

MATERIAL EXAMINED

HOLOTYPE. ♂, Wongabel State Forest, near Atherton, Queensland, 17.20S 145.31E, 18.xi.1981, J. Balderson; in ANIC.

PARATYPES: QUEENSLAND. QMBA: 21km S of Atherton, 1040-1100m, 1♂ (terminalia slide 50), D.K. Yeates and G.I. Thompson; Bellenden Ker Range, Cable Tower 5, 500m, NE Queensland, 1♀, x.xii.1982, S. Montague; Kroombit Tops (Upper TA 47 Ck), 45km SSW Calliope, rain forest, 1♀, 9-19.xii.1983, G. Monteith and G. Thompson.

ETYMOLOGY

The specific name refers to the closeness of the styles.

DESCRIPTION

Male. Eyes extending below antennal sockets (Fig. 13C), interocular space less than distance between ocelli and antennal sockets. Pronotum subparabolic (Fig. 13A). Hind wing with 6 complete and 4 (1 bifurcate) incomplete branches. Front femur Type A₃; pulvilli on 4 proximal tarsomeres, tarsal claws simple, symmetrical, arolia present. Abdominal terga 1 and 7 with medial setal specialisations, the latter (Fig. 13D) smaller and less dense than former. Supraanal plate transverse, hind margin subtruncate with small medial projection, long slender setae along dorsal surface, and medioventrally; ventral surface with pair of large, dark, triangular, intercercal ridges, each densely covered with small spines or spicules; right paraproct with long, slender, spinelike process, left one with wider, shorter, apically upturned acute process (Fig. 13B). Subgenital plate with pair of closely spaced styles at apex, left one slightly more robust than right (Fig. 13E). Genitalia as in Fig.

13E: hook on left side with subapical incision; median phallomere rodlike, apex unmodified; right phallomere with reduced cleft sclerite.

Colouration. Chestnut brown. Subgenital plate and part of supraanal plate may be darkly infuscated. Hind wing with distal region of anterior field and most of costal vein area infuscated.

Female. Eyes wide apart, interocular space greater than distance between ocellar spots. Supraanal plate trigonal, apex rounded. Hind wing infuscated as in male.

Measurements (♀ in parentheses). Length, 20.8-21.0 (20.0-21.0); pronotum length x width, 5.4-5.7 x 6.6-7.0 (5.6-6.1 x 7.3-7.4); tegmen length, 23.5-27.0 (24.5-26.0).

REMARKS

The hind margin of the supraanal plate of *styliparedra* (Fig. 13B) is similar to those of *gloriosa* (Fig. 3B) and some specimens of *fulva* (Fig. 2D). The right paraproct (Fig. 13B) is like that of *bifurcata* (Fig. 6F), and the intercercal ridge (Fig. 13B) resembles that of *gloriosa* (Fig. 3B). The position and closeness of the styles at the apex of the subgenital plate distinguishes *styliparedra* from other species in the genus.

Neotemnopteryx douglasi (Princis) n. comb. (Figs 14A-J, 34)

Shawella douglasi Princis, 1963, p. 11, fig. 1 (♂); Richards, 1967, pp. 37, 38, 41.

MATERIAL EXAMINED

HOLOTYPE. ♂, Jurien Bay, Western Australia, Limestone Caves, 30.17S 115.00E, ix.1958, associated with droppings of small cave dwelling bats, *Epicecus pumilus*, A.M. Douglas; Type no. 63-354, in WAMP.

WESTERN AUSTRALIA. WAMP: same data as holotype, 2 nymphs (det. as *Shawella douglasi* by Princis in 1961). ANIC: Smithies Cave, Jurien Bay, on guano, 1♂ (terminalia slide 40), 1♀ nymph, 14.xi.1964, B. Muir (det. as *Shawella douglasi* Princis by Mackerras).

DESCRIPTION

Male. Eyes variably reduced not reaching below level of antennal sockets (Fig. 14B,D), interocular space greater than distance between antennal sockets (Fig. 14C). Tegmina reduced in length, meeting along midline of body, tapering posteriorly to rounded apex which reaches to T5 or T7 (Fig. 14A). Hind wings vestigial, lateral, narrow, reaching T2 or hind margin of T3. Front femur Type A₃; pulvilli absent or with subob-

solete pulvillus on fourth tarsomere; tarsal claws simple, symmetrical, arolia small. First abdominal tergum with large, dense group of setae

medially (Fig. 14J). Seventh abdominal tergum unspecialised. Supraanal plate transverse, corners rounded, hind margin shallowly in-

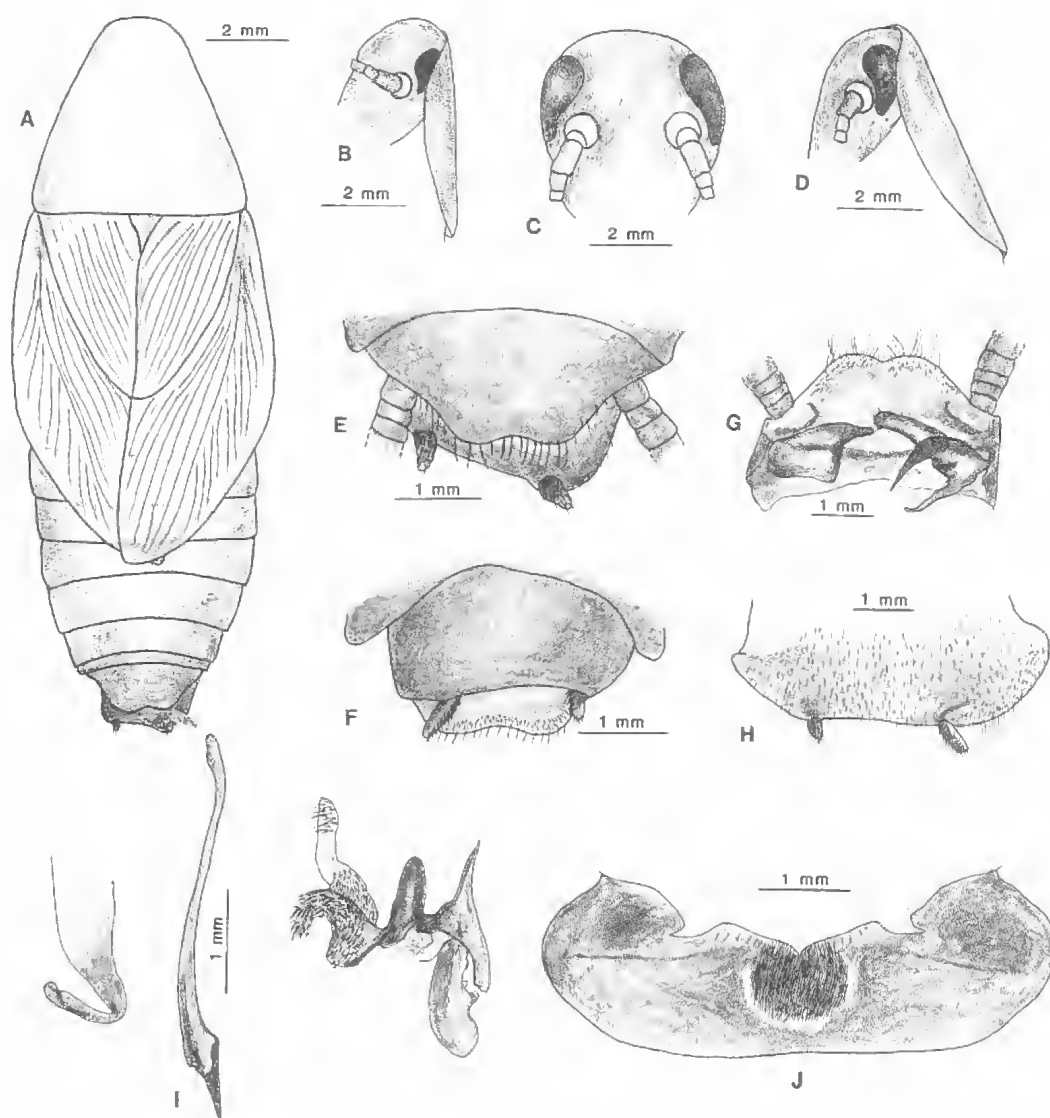


FIG. 14. *Neotemnopteryx douglasi* (Princis). ♂♂: A, Habitus; B-D, Eyes (lateral and frontal views); E, Supraanal and subgenital plates (dorsal view); F, The same (ventral view); G, Supraanal plate and paraprocts (ventral view); H, Distal region of subgenital plate, and styles (dorsal view); I, Genitalia (dorsal view); J, First abdominal tergum and setal gland. Localities: A, D, Holotype, Jurien Bay, W.A.; B, C, E-J, Smithies Cave, Jurien Bay, W.A.

dented, fringed with setae along edge, a dense group of small dark spines on distal ventral surface (Fig. 14E,F,G); right paraproct with pair of spinelike processes, intercercal ridge absent (Fig. 14G). Subgenital plate weakly asymmetrical, styles widely separated, right one slightly larger, both covered with small dark spines dorsally, interstylar margin straight (Fig. 14E,F,H). Genitalia as in Fig. 14I: hook on left side, with subapical incision; median phallomere apically acute; right phallomere with large setose sclerite.

Colouration. Light brown.

Female. Unknown.

Measurements (holotype in parentheses). Length, (17.5); pronotum length x width, (4.0 x 5.1) 6.2 x 6.4; tegmen length, (9.2) 13.0.

REMARKS

The eyes of the holotype are smaller than those of the large male from Smithies Cave (Fig. 14B,D). According to Princis, *douglasi* lacks pulvilli. This seems true for the holotype, but in the other specimen the fourth tarsomere appears to have a subobsolete pulvillus. As pointed out earlier, it is sometimes difficult to decide if pulvilli are completely absent. In *douglasi* the pulvilli regions, especially on the fourth tarsomeres, are lined on either side by a row of heavy spines, and in lateral view pulvilli appear to be absent. When viewed on their ventral surfaces, the apices of these segments are clear and colourless, and somewhat depressed (due to drying?). I have seen only 2 males, but it is possible that both eye reduction and loss of pulvilli could vary between populations of the same species, established in different caves. Individuals established longer in a particular cave might show greater loss of these structures (see races under *Paratemnopteryx stoneri*).

The well developed specialisation on T1 and the shapes of the right paraproct and median and right phallomeres (cp. Figs 1D,J and 14G,I) indicate that *douglasi* evolved from a *Neotemnopteryx*-like ancestor.

Trogloblattella Mackerras

Trogloblattella Mackerras, 1967, p.39. Type species: *Trogloblattella nullarborensis* Mackerras, by monotypy.

DIAGNOSIS

Eyes greatly reduced or absent. Antennae very long. Tegmina and wings reduced. ♂: first abdominal tergum weakly specialised. Front femur

with several large proximal spines followed by row of small piliform spinules, terminating in 3 large distal spines (Type B3); pulvilli and arolia absent, tarsal claws simple, symmetrical. Male genitalia, subgenital plate and styles, paraprocts, and male and female supraanal plates similar to these structures in *Neotemnopteryx*.

REMARKS

Mackerras (1967, p.39) was correct in stating that *Trogloblattella* is related to surface dwelling *Neotemnopteryx* (*Gislenia*) and *Paratemnopteryx* (*Shawella*). However, its male genitalia, subgenital plate, styles, and paraprocts are closer to *Neotemnopteryx* than to *Paratemnopteryx*. In the only other known species, *Trogloblattella chapmani* Roth from Sarawak (Roth, 1980, p.97), the male subgenital plate and styles differ distinctly from those of *T. nullarborensis* and clearly did not evolve from a *Neotemnopteryx*-like ancestor.

Distribution of *T. nullarborensis* is shown in Fig. 35.

Trogloblattella nullarborensis Mackerras (Figs 15A-1,35)

Trogloblattella nullarborensis Mackerras, 1967, p. 39, pl. 1A-D, figs 1-6 (♂ and ♀); Norris, 1970, p. 110, fig. 5.6.

HOLOTYPE (not examined)

♂. Western Australia, Abrakurrie Cave, about 24 miles WNW of Eucla, 27.ix.1966, D.C. and J. Lowry.

MATERIAL EXAMINED

WESTERN AUSTRALIA. ANIC: The following were determined by Mackerras, and most of them were reported in her paper under distribution but were not indicated as paratypes: Mullamullang Cave, Nullarbor, 1♀ (found dead about 1 mile in), 6.i.1966, J. Lowry, 1♀, Jan.1966, B. Robinson, 1♂, W Crowle, 1♀, 8.i.1965, E.G. Anderson; Abrakurrie Cave, about 24 miles WNW of Eucla, 1 nymph, 27.ix.1966, D.C. Lowry and J. Lowry; Thylacine Hole, 1♀, 12.viii.1966, 1 nymph, 23.x.1966, J. Lowry; Easter Extension, Mullamullang Cave, 1♂ (terminalia slide 80), 1.ix.1966, J. Lowry; Roaches Rest Cave, about 27 miles NE of Madura, 1♂, 29.viii.1966, D.C. and J. Lowry, and G. Hunt; Weehulbie Cave, 1 nymph, 3.x.1966, J. Lowry.

SOUTH AUSTRALIA. ANIC: Koonalda Cave, 31.24S 129.50E, 1♀, 11.x.1970, M.S. Upton and J.E. Feehan.

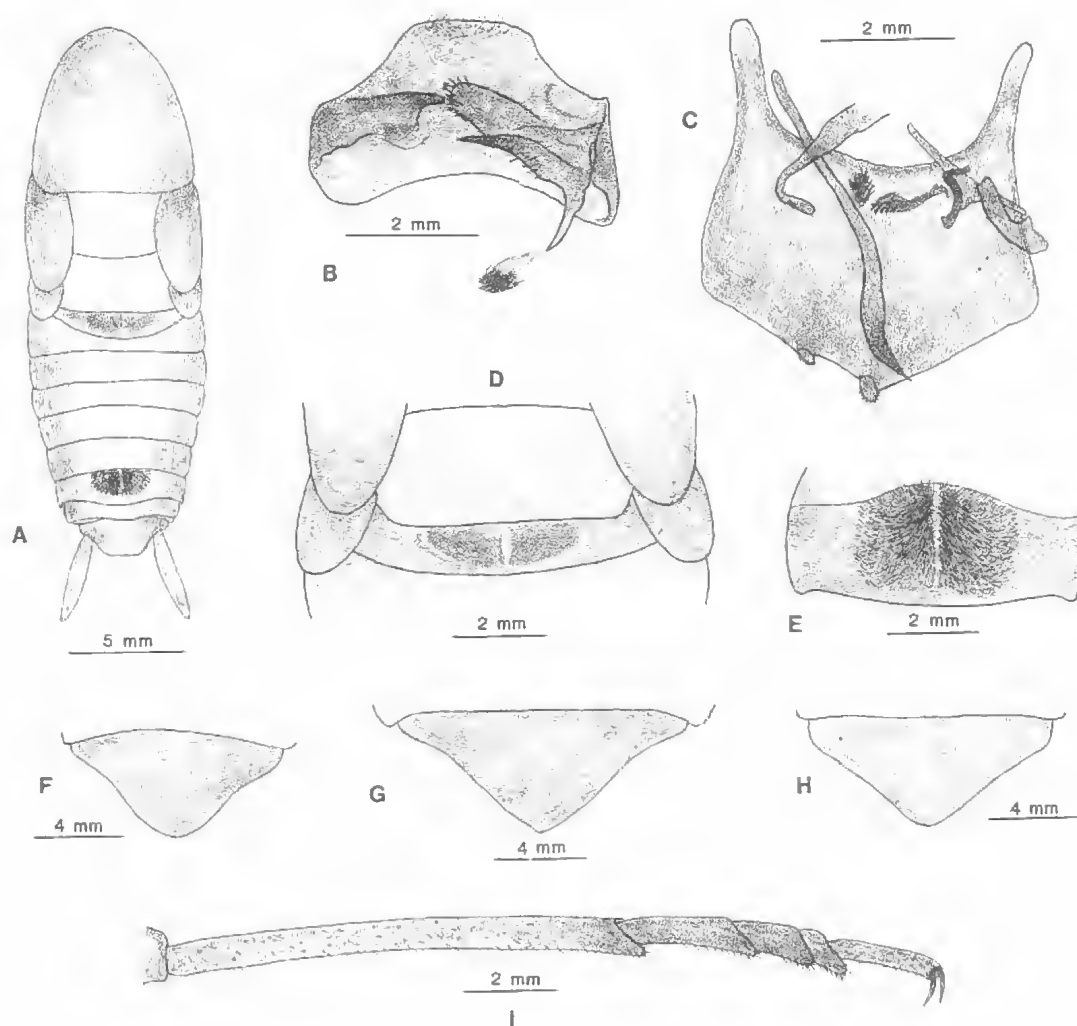


FIG. 15. *Trogloblattella nullarborensis* Mackerras. A-E, ♂♂: A, Habitus; B, Supraanal plate and paraprocts (ventral view); C, Subgenital plate and genitalia (dorsal view); D, Hind wing region showing reduced tegmina (in part) and hind wings, and glandular region on first abdominal tergum; E, Gland on seventh abdominal tergum; F-I, ♀♀: F-H, Supraanal plates (dorsal views); I, Tarsus. Localities: A, Roaches Rest Cave, W.A.; B-E, H, I, Mullamulang Cave, W.A.; F, Koonalda Cave, S.A.; G, Thylacine Hole, W.A.

DESCRIPTION

Male. Eyes and ocelliform spots absent. Antennae considerably longer than abdomen. Tegmina narrow, leaf-like, almost reaching hind margin of metanotum, venation obsolete; hind wings resemble tegmina in colour and texture, smaller, reaching to about middle of T1 or T2 (Fig. 15A). Front femur Type B₃; pulvilli and arolia absent (Fig. 15I). First abdominal tergum

weakly specialised with a medial elliptical shallow depression divided medially by low, rounded, tapering, longitudinal ridge, which may or may not have a few setae anteriorly (Fig. 15D). Seventh abdominal tergum with a huge, round, medial depression filled with setae, and occupying most of segment (Fig. 15A,E). Supraanal plate subtrapezoidal, hind margin slightly deflexed (Fig. 15B); paraprocts as in Fig. 15B.

Subgenital plate weakly asymmetrical, styles dorsally spined, small, right one slightly larger and located in middle of hind margin (Fig. 15C). Genitalia as in Fig. 15C: hook on left side; median phallomere apically acute; right phallomere with a small setose plate and subobsolete cleft sclerite.

Colouration. Yellowish brown to brown.

Measurements (Mackerras's measurements in parentheses). Length, 22.0 (24.0-27.5); pronotum length x width, 7.0-8.0 x 7.3-8.4 (9.0 x 10.0); tegmen length, 5.1-5.8 x 2.4-2.9 (7.0 x 4.0).

Female. Much larger than male. Supraanal plate broad basally, sides tapering to a subacute or rounded apex (Fig. 15F-H).

Measurements (Mackerras's measurements in parentheses). Length, 32.5-38.5 (34.0-38.5); pronotum length x width, 10.0-12.0 x 10.1-12.5 (13.0 x 13.0); tegmen length x width, 8.2-9.5 x 3.7-5.0 (11.0 x 5.5).

Paratemnopteryx Saussure

Paratemnopteryx Saussure, 1869, p. 273; Kirby, 1904, p. 106; Shelford, 1908b, p. 9; Princis, 1954, p. 35.

Type species: *Paratemnopteryx australis* Saussure, by monotypy.

Shawella Princis, 1951, p. 61; 1954, p. 35. Type species: *Blatta coulouiana* Saussure, Princis, 1951, p. 61). N. Syn.

Franwalkeria Princis, 1954, p. 34. Type species: *Franwalkeria glauerti* Princis, by monotypy. N. Syn.

REMARKS

The armament on the front femur, and hind wing venation in fully winged forms of *Paratemnopteryx*, *Shawella*, and *Franwalkeria* are similar. Male characters such as style morphology and their placement on the subgenital plate, morphology and position of the setal gland on T1, and the genital phallomeres also show basic similarities. The principal characters used by Princis to distinguish these 3 nominal genera are the degree of reduction of the tegmina and wings, and the presence or absence of pulvilli and arolia. I have discussed, under diagnostic characters, why these characteristics cannot be used as distinguishing characters in these taxa, and therefore I am synonymising them.

Princis (1969, p. 732) listed 5 species of *Paratemnopteryx*, one with a query. Two of these species are synonyms. I recognise 10 species of which 4 are new and 3 are new combinations.

Three of the taxa are cavernicolous. Some of the epigeal species have reduced eyes and lack pulvilli and/or arolia, and apparently are preadapted for cave dwelling. Based on front femur type, hind wing venation, male genital phallomeres and style morphology, *Paratemnopteryx* is closely related to *Neotemnopteryx*. Distribution of *Paratemnopteryx* species is shown in Fig 35; *Paratemnopteryx centralensis* also occurs in New Guinea.

DIAGNOSIS

Eyes usually somewhat reduced, not extending below level of antennal sockets (Figs 16D, 18A, 24B), sometimes well developed extending below level of antennal sockets (Figs 29A, 30A, 31A). Tegmina reduced with hind wings smaller or vestigial (Fig. 16E, G), or both completely developed reaching beyond end of abdomen (Fig. 31B); in fully developed tegmina and wings, discoidal sectors of former oblique (Fig. 31E); hind wing with discoidal, median and cubitus veins straight, latter with 2-4 complete and 0 (rarely) to 4 incomplete branches, apical triangle absent (Figs 16A, 20F, 30F). Anteroventral margin of front femur usually Type A3, rarely Type A2; pulvilli present on 4 proximal tarsomeres (Fig. 18H), or absent from some or all segments (Fig. 18G), arolia present (Fig. 16I), or absent. ♂: First abdominal tergum usually modified, rarely unspecialised; when present, gland area consisting of setae arranged along anterior border of tergum, sometimes partly hidden by overlapping hind margin of metanotum (Figs 17B, 27C), or grouped anteromedially (Fig. 30D). Seventh abdominal tergum usually unspecialised, rarely with large dense group of setae, medially (Figs 18B, 27A). Supraanal plate symmetrical without intercercal ridge on ventral surface; paraprocts dissimilar (e.g. Fig. 17C). Right and left styles usually similar, or almost so, widely separated, symmetrically placed on hind margin of subgenital plate (e.g. Fig. 17D, E). Hooklike genital phallomere on left side. Ootheca rotated prior to deposition.

Based on male characters, species of *Paratemnopteryx* can be arranged in the following species-groups:

1. *coulouiana* species-group. Right and left styles similar in size, covered in part with short dark spines.
- A) Supraanal plate with hind margin truncate,

rounded, or with a shallow indentation. Right paraproct similar to that shown in Fig. 17A.

a) Seventh abdominal tergum specialised. Pulvilli present or absent, arolia present. Species: *stonei*. The following lack a specialisation on T7

b) Pulvilli and arolia present. Species: *couloniana*.

c) Pulvilli present, arolia absent. Species: *glauerti*.

d) Pulvilli and arolia absent. Species: *atra*, *australis*, *rufa*.

B) Supraanal plate with hind margin deeply excavated, right paraproct as in Fig. 28A. Right genital phal-
lomere as in Fig. 28B. Seventh abdominal tergum specialised. Pulvilli and arolia present. Species: *broomehillensis*.

2. *centralensis* species-group. Styles very small, similar, cylindrical (Fig. 31D), or dissimilar, right one bearing long, curved setae, left one minute, cylindrical, without long setae (Fig. 30E). Right genital phal-
lomere as in Figs 29B, 30G, 31D. First abdominal tergum with or without specialisation. Species: *centralensis*, *howarthi*, *suffuscula*.

This group, originally containing only *centralensis*, was in the genus *Symploce* (Roth, 1985b, p.300).

KEY TO MALES OF *PARATEMNOPTERYX*

1. Styles large, similar in shape, partially covered with short, dark spines (e.g. Figs 17E, 23D) 2

Styles small, cylindrical, similar (Fig. 31D), or dissimilar (Fig. 30E) 8

2. Seventh abdominal tergum with large, dense, setal specialisation (Figs 18B, 27A) 3

Seventh abdominal tergum unspecialised 4

3. Hind margin of supraanal plate shallowly concave (Fig. 18C). (cavernicolous) *stonei*

Hind margin of supraanal plate with U-shaped excavation (Fig. 27B) (epigeal)
..... *broomehillensis*

4. Arolia present. Supraanal plate with apex of hind margin narrow, concavely excavated (Fig. 17B). (epigeal) *couloniana*

Arolia absent. Supraanal plate not as above .. 5

5. Pulvilli present. Tegmina and wings fully developed. (epigeal) *glauerti*

Pulvilli absent or subobsolete 6

6. Supraanal plate broadly rounded (Fig. 22D). Tegmina not quite reaching tip of abdomen, tapering towards rounded apex (Fig. 22A). (cavernicolous) *atra*

Hind margin of supraanal plate not as above. Tegmina shorter, reaching hind margin of T2 or T3 (Fig. 24A) 7

7. Hind margin of supraanal plate almost truncate, corners rounded (Fig. 24E). (epigeal) *rufa*

Hind margin of supraanal plate shallowly concave (Fig. 23C). (epigeal) *australis*

8. Styles similar, cylindrical (Fig. 31D). First abdominal tergum unspecialised. (epigeal) *suffuscula*

Styles dissimilar, right one with curved setae, left one smaller, sometimes subobsolete, without curved setae (Fig. 30E). First abdominal tergum specialised (Fig. 30D) 9

9. Supraanal plate broadly rounded (Roth, 1984: figs 18A, 19F). Pulvilli present on 4 proximal tarsomeres. (epigeal) *centralensis*

Supraanal plate trigonal (Fig. 30H). Pulvilli absent. (cavernicolous) *howarthi*

Paratemnopteryx couloniana (Saussure) n. comb. (Figs 16A-H, 17A-H, 35)

Blatta couloniana Saussure, 1863, p. 150, pl. 1 fig. 14 (♂ and ♀); Walker, 1868, p. 87.

Periplaneta concinna (nec Haan, 1842): Brunner, 1865, p. 229 (♂); Princis, 1969, p. 731.

Temnopteryx couloniana (Saussure), 1869, p. 240; Walker, 1871, p. 18; Tepper, 1894, p. 170; Kirby, 1904, p. 104.

Blatta brunneri Kirby, 1903, p. 375; 1904, p. 139; Princis, 1954, p. 35.

Ceratinoptera couloniana (Saussure): Shelford, 1908b, p. 19.

Shawella couloniana (Saussure): Princis, 1951, p. 62 (♂); 1954, p. 35; McKittrick, 1964; Roth, 1968, p. 110, fig. 106 (ootheca); Johns, 1966, pp. 95, 96, 134.

Paratemnopteryx blattoides Tepper, 1895b, p. 150. N. Syn.

Paratemnopteryx australis (nec Saussure): Tepper, 1895b, p. 149 (♂) (misidentification).

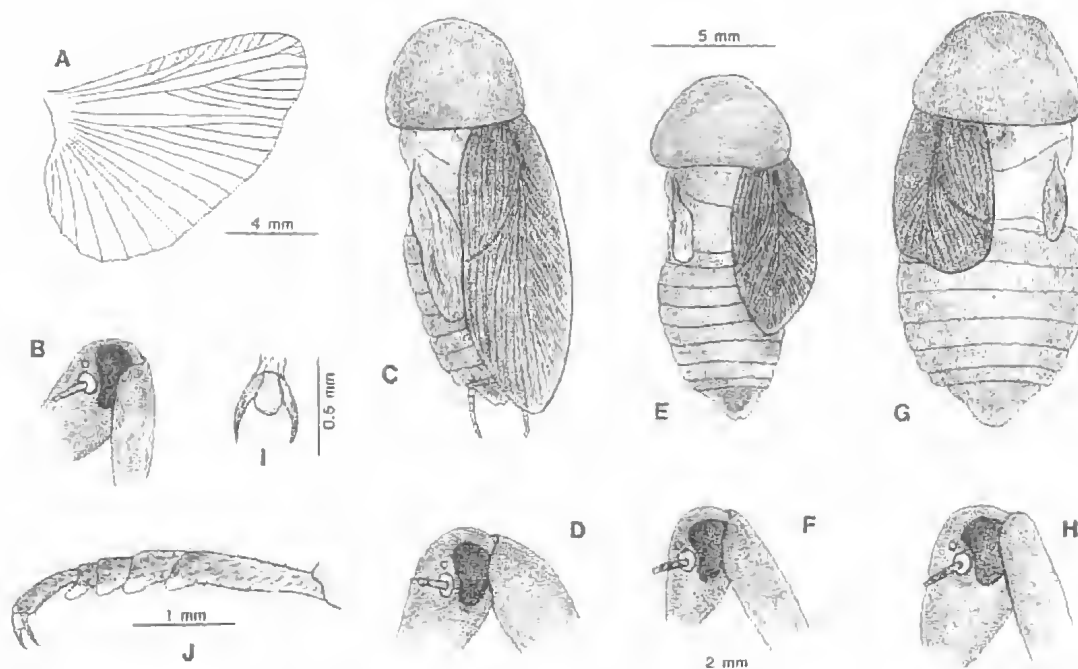


FIG. 16. *Paratemnopteryx coulöniana* (Saussure). A-F, ♂♂: A, Fully developed hind wing; B, Eye (lateral view) from ♂ with fully developed hind wings; C, D, Habitus (left tegmen removed) and eye (lateral view); E, F, The same; G, H, ♀, habitus (right tegmen removed), and eye (lateral view); I, Tarsal claws and arolium (frontal view); J, Tarsus (lateral view). Localities: A, B, 31 km west northwest of Tenterfield, N.S.W.; C, D, Canberra, A.C.T.; E, F, Black Mt., A.C.T.; G, H, Eildon, Victoria; I, J, Same as A, B.

Methana sp., May, 1963, p. 44, fig. 3 (misidentification); Johns, 1966, p. 134.

REMARKS

Shelford examined Tepper's syntypes of *Paratemnopteryx blattoides* and correctly concluded that one of the adults was a male of '*Ceratinoptera*' *coulöniana* (Saussure). However, he incorrectly believed that the other male, which Tepper described as a female, was a valid specimen of *blattoides*. Actually this specimen also is *coulöniana*. Shelford apparently was misled by the fact that the lectotype has fully developed tegmina and wings, whereas the paralectotype is brachypterous. Also the characteristic concavely excavated apex of the supraanal plate, typical of *coulöniana*, and distinct in the paralectotype of *blattoides*, is not clear in the lectotype because the edges of the plate are curled upwards and the weakly concave apex looks slightly different. The third syntype of *blattoides* is a nymph with the same locality as the adults; it is badly damaged and labelled *Paratemnopteryx ?blattoides*. It is not a

Paratemnopteryx; there are no spines on the posteroventral margins of front and mid femurs (hind legs missing), and the anteroventral margin of the front femur has piliform spinules only and one large distal spine (Type C₁).

MATERIAL EXAMINED

All specimens are brachypterous unless indicated as macropterous (macr.): AUSTRALIA. MHGN: ♂ lectotype (here designated) and 1 ♀ paralectotype of *Blatta coulöniana* Saussure.

VICTORIA. NMVM: Narre Warren, ♂ (macr.) lectotype (here designated), and 1 ♂ (incorrectly labelled ♀) paralectotype of *Paratemnopteryx blattoides* Tepper (the lectotype has a handwritten label 'copy from above', i.e., copy from the label on the paralectotype which states '*Ceratinoptera coulöniana*' Sauss.; Tepper describes 2 ♂ as opposite sexes of *blattoides*. His ♀ = '*Cerat. coulöniana* Sauss., det. by Shelford, sent xii.1907'. The paralectotype also has a label 'sent to Shelford, xii.1907; see other specimen of Tepper with note by Shelford.'). ANIC: 2 MacAlistair Crt, Surrey Hills, 1 ♂, inside house, 2.xi.1981, M.R. Harvey; Snobs Creek Fish Hatchery near Eildon, 1 ♀, inside

building, 13.ii.1979, M.R. Harvey; Swift's Crk, 1 ♀, 10.x.1949, T.G. Campbell; Glen Wills, 20 km E of Falls Creek, 1 ♂, 13.ix.1972, M. Schwartz. The following were collected by H.M. Cane: 28 miles NNE of Cavendish, 1 ♂, 1 ♀, 11.iv.1951; Mangalore, 1 ♀, 9.iv.1951. SAMA: Victoria, 1 ♀, C. French (incorrectly reported as *Paratemnopteryx australis* Sauss. by Tepper, 1895, p.150). MCZH: Melbourne, 1 ♂ (macr.), H. Edwards.

NEW SOUTH WALES. ANIC: Dorrigo, 1 ♂ nymph, 21.iii.1954, E.F. Riek; Armidale, 1 ♂ (macr.), 1.i.1960, C.W. Frazier; Avalon, 1 ♂, 1 ♀, 7.xii.1951, M.F. Day; Bankstown, 1 ♂, 1 ♀, xi.1953, Holmes; Coolamon, 1 ♂ (macr.), to light, 8.i.1954, A.L. Dyce; 65 km NW of Nyngan, 1 ♂ (macr.), 21.x.1949, E.F. Riek; 31 km WNW of Tenterfield, 1 ♂ (macr.), 23.xi.1983, D.C.F. Rentz and M.S. Harvey; Nullo Mt., 20 miles NE of Rylstone, 1 ♂, 11.xi.1950, T.G. Campbell; 16 miles E of Bungendore, 1 ♀, 18.xii.1951, H.M. Cane; Hearne Bay, Georges River, 1 ♀, 6.i.1941, Mrs Day; Sydney, 2 ♀ ♀ nymphs, 20.v.1925, W.W. Froggatt; Sutherland, 1 ♂ nymph, xi.1927, M. Fuller; Braidwood, 1 ♀ nymph, 3.viii.1949, F.J. Gay; Nelligen, 1 ♀ nymph, 13.viii.1949, 2 ♀ ♀ nymphs, 16.iv.1949, K.H.L. Key, 1 ♀ nymph, 3.xi.1949, Cane and Gemmell. The following were collected by H.M. Cane: 4 miles SE of Braidwood, 1 ♀ nymph, 4.iii.1953; Gundy, 1 ♂ and 1 ♀ nymphs, 5.iv.1949; Towamba, 2 ♀ ♀ nymphs, 27.iv.1949; 3 miles SSW of Bega, 3 ♂ ♂ and 3 ♀ ♀ nymphs, 27.iv.1949. DARA: Bass Hill, 1 ♂ (macr.), 1 ♀, 2.xii.1953; Roseville, 1 ♂ (macr.), infesting house, 30.xii.1952; Dapto, 2 ♀ ♀, 2.ii.1956; Sydney, 1 ♀, ii.1961; Gladesville, 1 ♀ (with ootheca), infesting house, 14.i.1953, R. Wilson; Herne Bay, 1 ♀, 7.ix.1952; Waratah, 1 ♀, 1 nymph, infesting house, 5.xi.1952, R. Gollidge; Belfield, 1 ♀ (with ootheca), in house, 29.i.1954; Seven Hills, 1 ♀, 3.xii.1953, Mrs E. Grudnoff; Bankstown, 1 ♂, 26.xi.1953; Eastwood, 1 ♂, 2.xii.1953; East Hills, 4 nymphs, 6.iii.1953, 1 nymph in house, 11.iii.1954; 'Gilbula', 16 km S of Campbelltown, 1 nymph, 1.vii.1984, S.G. Hunter; Berridale, 1 ♂, 20.xi.1961; Bankstown, 2 ♂ ♂, 16.xi.1954; Wollongong, 1 ♂, eating papers in cardboard, 9.xii.1960; Nundle, 1 ♀, 13.xi.1958; Punchbowl, 1 ♂, indoors, infesting linen cupboards, also noticed outside underneath wood, etc., 9.xii.1954, Caller; Seven Hills, 1 ♂, in house, 7.i.1961; Wahroonga, 1 ♂, 7.xi.1952, H.M. Bungham; Cammeray, 1 ♀, 21.x.1957; Clovelly, 1 ♂, 25.xi.1959, W.E. Wright; Northbridge, 1 ♂, x.1950, 1 ♂, 14.v.1951; Groman, 1 ♂, 6.xi.1958, T.V. Bourke; Springwood, 1 ♀, 19.xi.1954; Beverly Hills, 1 ♂, 1 ♀ nymph, 24.i.1955; Blacktown, 1 ♂ nymph, 22.iii.1964; Forestville, 3 ♂ ♂ and 1 ♀ nymphs, indoors, 16.iv.1962, Mrs Holder;

Rydalmere, 1 ♀ nymph, attacking dried insects in collection, 5.ix.1962, M.J. Nikitin; Blacktown, 1 ♂ and 1 ♀ nymphs, under bricks, 8.vi.1975, J.A. Longley; Lalor Park, 2 ♂ ♂ nymphs, 2.v.1961; Narwee, 1 ♂ nymph, infesting house and believed to be damaging articles of clothing, 8.iv.1954, A.R. Wood. The following were collected by C.E. Chadwick: Dapto, 2 ♀ ♀, in house at night, 22.xi.1957; Wollongong, 1 ♂, under bark of *Eucalyptus*, 15.x.1950; Beverley Hills, 2 ♂ ♂, 1 ♀ nymph, in house, iv.1951; Lismore, 1 ♂, in garage, 10.x.1965; North Ryde, 1 ♀, 28.iii.1975, 1 ♀, 20.ii.1975. SAMA: Sydney, 1 nymph, labelled *Paratemnopteryx australis* Sauss., by Tepper, 19.ix.1894, Froggatt, 1 ♀, Lea.

SOUTH AUSTRALIA. ANIC: Ardrossan (Browns Scrub), 1 ♂, 1 ♀ (with ootheca), 1 ♀ (genitalia slide 45), 1 ♂, 24.vii.1979, H.M. Cameron; Ardrossan, 1 ♀ nymph, 31.viii.1949, 1 ♀, i.1950, 1 ♀, 5.i.1951, H.M. Cane; no exact locality, 2 ♂ ♂, 2-12.i.1952, H.M. Cane. SAMA: Adelaide, public library, 1 ♂ (macr.) (incorrectly reported as *Paratemnopteryx australis* Sauss. by Tepper, 1895b, p.149. DARA: Gawler, 1 ♂, under bark of *Eucalyptus* sp., 24.xii.1967, C.E. Chadwick.

QUEENSLAND. ANIC: 15 km S by W of Charleville, 26.32S 146.12E, 1 ♂ (macr.), 21.x.1975, M.S. Upton. AUSTRALIAN CAPITAL TERRITORY. ANIC: Canberra, 1 ♂ (macr.), 21.xii.1951, 1 ♂ (terminalia slide 41), 4 ♀ ♀ (1 with genitalia slide 42), E.F. Riek, 1 ♂, xii.1949, 1 ♀, 2 ♀ ♀ nymphs, 14.vii.1949, H.M. Cane, 2 ♀ ♀, iii.1944, D.F. Waterhouse, 1 ♀, 15.xi.1954, H.M. Cameron, 1 ♀, 8.i.1950, 1 ♀, 19.ii.1950, K.H.L. Key, 1 ♂, xii.1931, 1 ♀ nymph, in house, ii.1964; Canberra (Downer), 1 ♂, 2 ♀ ♀, 14.i.1968, K.H.L. Key; Canberra (Farrer), 35.22S 149.05E, 1 ♀, 2.ii.1984, 1 ♀, 21.ii.1984, D.C.F. Rentz; Canberra (Turner), 1 ♀, 8.iv.1984, A.M. Hastings; Tinbinbilla, 1 ♀, 17.ix.1950, H.M. Cane; Black Mt., in glass house, CSIRO, 1 ♂, 1 ♀, viii.1948, R.W. Kerr, 1 ♂, 21.x.1949, 1 ♂, x.1949, 'culture parent adults from Black Mt. and CSIRO Labs, ACT, killed 20.xi.1950', 11 ♂, 2 ♀ ♀, 5 ♂ ♂ and 3 ♀ ♀ nymphs, 24.vii.1949, 2 ♂ ♂ and 1 ♀ nymphs, 7.x.1949, 1 ♀ nymph, 21.x.1949, H.M. Cane, 1 ♂ nymph, 13.ix.1949, I.F.B. Common; Cotter R., 2 ♀ ♀ nymphs, 16.xi.1949, H.M. Cane; Tinbinbilla Ck, 2 ♀ ♀ nymphs, 17.vii.1949, E.F. Riek; Canberra (Deakin), 18 ♂ ♂, 4 nymphs, 2.xi.1983, E.B. Britton.

DESCRIPTION

Male. Eyes extend to about level of antennal sockets in macropterous and brachypterous morphs (Fig. 16B,D,F). Tegmina normal width, usually reduced in length reaching hind margin T5, wings more reduced, narrow, reaching T1 (Fig. 16E); rarely, reduced tegmina are longer

TABLE 2. Measurements of *Paratemnopteryx coulöniana*.

	Length	Pronotum length x width	Tegmen length
macropterous (♂)	13.2-15.5	3.7-4.7 x 5.0-5.8	12.0-15.5
brachypterous (♂)	12.8-17.8	3.6-4.8 x 5.3-6.8	6.7-11.0
brachypterous (♀)	15.8-20.9	4.5-5.7 x 6.8-7.6	5.4-7.5

reaching T7 or supraanal plate, in which case hind wings longer and wider, reaching T2, or between T3 and T4 respectively; some individuals have fully developed tegmina and the wings reach about middle of abdomen (Fig. 16C) or end of abdomen, if latter, median vein is simple or bifurcate apically, cubitus vein with 3-4 complete and 0-1 incomplete branches, apical triangle absent (Fig. 16A). Front femur Type A3; pulvilli distinct on 4 proximal tarsomeres (Fig. 16J), arolia present (Fig. 16I,J). First abdominal tergum with setae grouped transversely along thickened anterior margin of segment, partly hidden by overlapping edge of metanotum (Fig. 17B). Seventh abdominal tergum unspecialised. Supraanal plate shallowly convex, raised portion delineated from flattened border by shallow groove paralleling tapering margins of plate, hind margin apex shallowly concave (Fig. 17A), sometimes almost rounded. Dissimilar paraprocts as in Fig. 17C. Subgenital plate symmetrical, transverse, styles similar, symmetrically placed, widely separated on either side of midline, suberect, or usually curved, apices lateral, interstyler margin straight (Fig. 17D,E). Genital phallomeres as in Fig. 17F: hook on left side with subapical incision; median phallomere rodlike, apex blunt, unmodified; right phallomere with cleft and spined sclerite.

Colouration. Dark brown or dark reddish brown.

Female. Eyes reduced reaching to about level of antennal sockets (Fig. 16H). Tegmina reaching to middle of T2 or T3; hind wings narrow, vestigial (Fig. 16G). I have seen no macropterous females. Supraanal plate trigonal, apex rounded (Fig. 17G). Genitalia as in Fig. 17G: right paratergite with an enlarged sclerotised plate (arrow). Ootheca rotated prior to deposition;

dark reddish brown, 18 small, rounded teeth in keel, 17 egg cells, 3.5mm high, 5.6mm long (Fig. 17H).

Nymph. Resembles adult but lacks pulvilli, arolia and tegmina and wings.

Measurements. See Table 2.

REMARKS

Brachypterous morphs of *P. coulöniana* are more common than macropterous forms. All macropterous morphs are males, and the hind wings of brachypterous individuals in both sexes are smaller, usually rudimentary, than the reduced tegmina. Collection data suggest that this species may be domiciliary, and is the most common and widespread member of the genus. Outside of Australia, the species was introduced and is established in New Zealand (Johns, 1966, p.134).

Paratemnopteryx stonei n. sp. (Figs 18A-H, 19A, B, 35)

MATERIAL EXAMINED

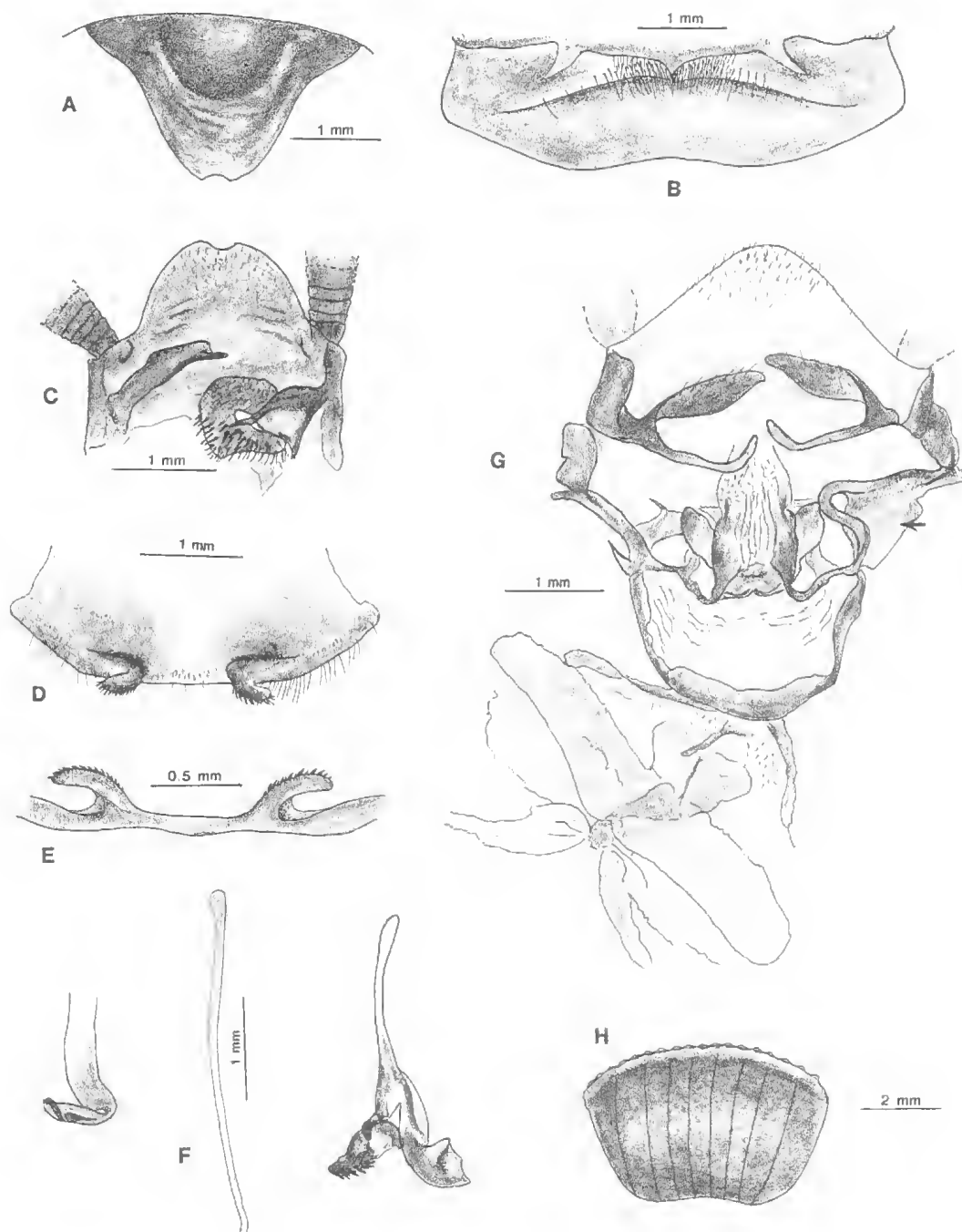
HOLOTYPE: ♂, Chillagoe Caves National Park, Royal Arch Cave, RA-117, NE Queensland, Australia, 6.vi.1985, F.D. Stone; in QMBA.

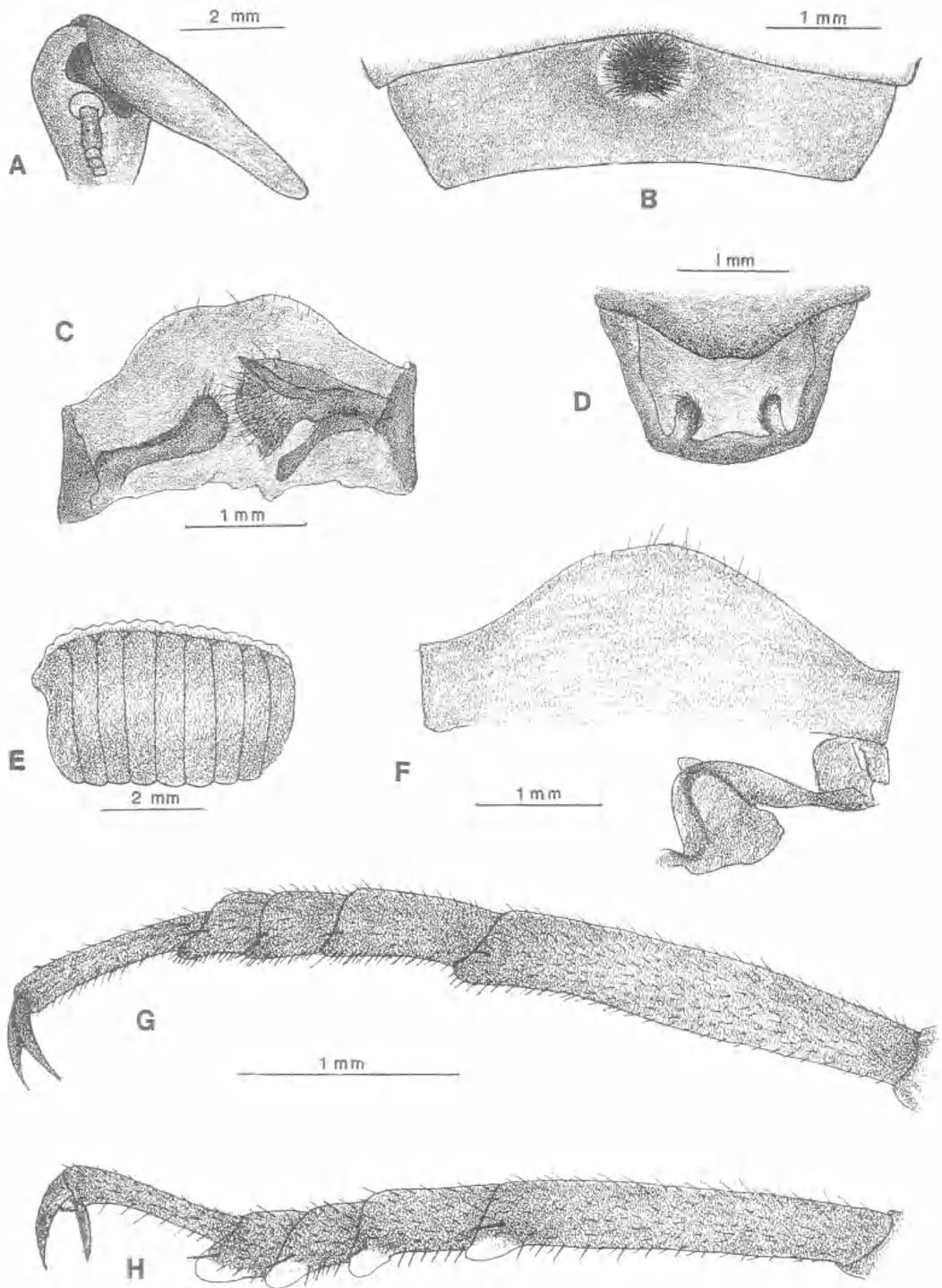
PARATYPES: QUEENSLAND. QMBA: same data as holotype, 3♂♂, 5♀♀ (1♂, 1♀, retained at MCZH); Royal Arch Cave, 1♀, 7 nymphs, 2.viii.1984, F.D. Stone, T. Connery, and N. Sullivan, 2♀♀, 1 nymph, 2.vii.1984, F.D. Stone, 1♂ (terminalia slide 46), 4♀♀ (1 with genitalia slide 47), 2♂♂ and 4♀♀ nymphs, 19.vii.1982, Explorers Club, 3♀♀, 1♂ and 2♀♀ nymphs, 29.v.1985, F.D. Stone, F.G. Howarth, and K. Eipel.

ETYMOLOGY

The species is dedicated to Dr F.D. Stone of

FIG. 17. *Paratemnopteryx coulöniana* (Saussure). A-F, ♂♂: A, Supraanal plate (dorsal view); B, First abdominal tergum and setal specialization; C, Supraanal plate and paraprocts (ventral view); D, Distal region of subgenital plate, and styles (dorsal view); E, Styles (rear view); F, Genitalia (dorsal view); G, ♀, supraanal plate and genitalia (ventral view; arrow indicates enlarged region of right paratergite); H, Ootheca. Localities: A, B, E, Bankstown, N.S.W.; C, D, F, Canberra, A.C.T.; G, Ardrossan (Browns Scrub), S.A.; H, Belfield, N.S.W.





the University of Hawaii, who collected some of the specimens.

DESCRIPTION

Male. Eyes developed, not reaching below level of antennal sockets (Fig. 18A), interocular space about same as distance between antennal sockets. Tegmina reduced reaching to about hind margin of T6 (see variants), hind wings vestigial extending to about T1 or T2, lateral, narrow, membranous, with a few visible veins. Anteroventral margin of front femur Type A3; pulvilli essentially absent from all tarsomeres (Fig. 18G) (see variants), tarsal claws long, simple, symmetrical, arolia small. First abdominal tergum weakly specialised with a few setae along anteromedial border, often completely covered by hind margin of metanotum. Seventh abdominal tergum with a large dense group of setae in an anteromedial depression (Fig. 18B), partly hidden by T6. Supraanal plate transverse, hind margin broadly rounded, convex or weakly concave; paraprocts dissimilar, right one with a large setose lobe and sclerotised spinelike process, left one with or without a short, stout, fingerlike process (Figs 18C, 19A). Subgenital plate essentially symmetrical, sides upturned, styles erect (Fig. 18D) or deflexed ventrad, symmetrically placed, widely separated, spines on dorsal surface, interstyler margin weakly convex or straight, with a dense group of short spines along margin of plate at base of styles (Figs 18D, 19B). Genitalia as in Fig. 19B: genital hook on left side, robust, median phallomere rodlike, broader on basal half, right phallomere with a cleft and setose plate.

Colouration. Reddish brown.

Female. Supraanal plate with hind margin rounded or with a shallow apical indentation; right paratergite with an enlarged sclerotization (Fig. 18F). Tegmina slightly longer than in male. Pulvilli essentially absent, but in some specimens they are weakly indicated on tarsomeres 3 and 4 of the mid legs.

Measurements (♀ in parentheses): Length, 16.0–18.7 (16.8–20.0); pronotum length x width, 4.2–5.0 x 6.5–6.8 (5.1–6.1 x 6.9–7.7); tegmen length, 10.3–11.7 (10.5–12.0).

Nymph. Resembles adult except for absence of tegmina and wings. Eyes present, pulvilli and arolia absent.

REMARKS

Mackerras (*in* Richards 1967, p.40) may have recorded this species as ?*Gislenia* sp. from 21 nymphs which could not be placed with certainty to genus. Some of her specimens came from Royal Arch Cave, Chillagoe Caves, and probably these are the same as *stonei* collected in the same cave. Richards stated that 'They have been collected from nine caves ranging in distribution from Northern Queensland to Central New South Wales, and also just across the South Australian border. Many are guanobites. Specimens from Ashford Cave in northern New South Wales, and Riverton and Viator Caves just across the Queensland border, all show loss of pigmentation. The nymphs from Alexandra Cave, Naracoorte, are troglaphiles. No bats occur in this cave. Cockroaches are present in large numbers breeding in the cave, but show no sign of cave adaptation.' Specimens of *stonei*, including its variants, show no loss of pigmentation.

VARIANTS

Specimens taken in different caves may vary from the typical material from Royal Arch Cave, in size, length of tegmina (hind wings are very small in all morphs) (Table 3), and presence or absence of pulvilli (all have small arolia). The important male characters such as genital phalloberes, subgenital plate, styles, supraanal plate and paraprocts, and tergal glands are so similar in all the forms that I consider them to be races of the same taxon (not paratypes).

RACE A

MATERIAL EXAMINED

QUEENSLAND, QMBA: Chillagoe Caves: Clam Cave, 2♂♂, 3♀♀, 21.vi.1984, F.G. Howarth and F.D. Stone (1♀ retained at MCZH), 1♂ (terminalia slide 58), 3♀♀, 6 nymphs, 21.vi.1984, 1♂, 2♀♀ (1 with ootheca), 27.vi.1984, F.G. Howarth and F.D. Stone; Rhino Cave, 2♂♂, 1 nymph, 22.vi.1984, F.D. Stone; Spatial Cave, 1♂, 22.vi.1984, F.D. Stone.

FIG. 18. *Paratemnopteryx stonei*, n. sp., paratypes and races. A–D, ♂♂: A, Eye (lateral view); B, Setal gland on seventh abdominal tergum; C, Supraanal plate and paraprocts (ventral view); D, Supraanal and subgenital plates and styles (rear view); E, Ootheca; F–H, ♀♀: F, Supraanal plate and enlarged right paraproct (ventral); G, H, Front tarsi (lateral views). Races and Qld localities: A, E, H, Race A, Clam Cave; B, D, Race C, Barkers Cave, Yarramulla Station; C, F, G, Typical morph, Royal Arch Cave.

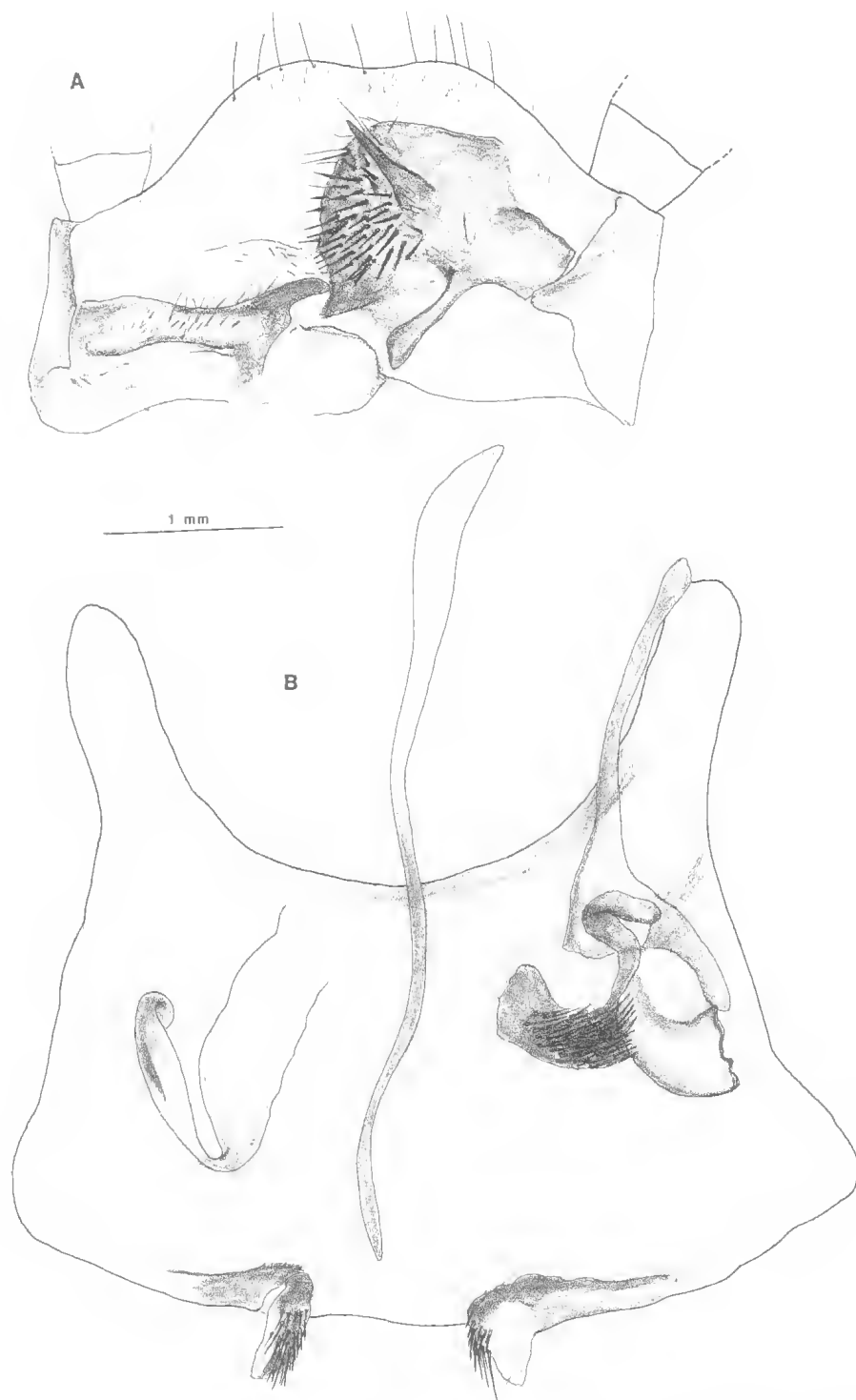


FIG. 19. *Paratemnopteryx stonei*, n. sp. ♂, Race C, Undarra, Qld, Barkers Cave: A, Supraanal plate and paraprocts (ventral view); B, Subgenital plate and genitalia (dorsal view).

TABLE 3. Variation in pronotum length and width and tegmen length in races of *Paratemnopteryx stonei*.

	Typical	Race A	Race B	Race C	Significance between morphs (*significant at $P \leq 0.05$)
Pronotum (mm) Length (♂) Mean $\pm$ S.D.	4.8 $\pm$ 0.4	5.0 $\pm$ 0.2	4.6 $\pm$ 0.2	4.2 $\pm$ 0.2	T & A = 0.42; T & B = 0.23; T & C = 0.00*; A & B = 0.01*; A & C = 0.00*; B & C = 0.00*
Width (♂) Mean $\pm$ S.D. N	6.6 $\pm$ 0.1 5	6.7 $\pm$ 0.3 5	6.4 $\pm$ 0.1 8	5.8 $\pm$ 0.3 24	T & A = 0.61; T & B = 0.01*; T & C = 0.00*; A & B = 0.02*; A & C = 0.00*; B & C = 0.00*
Length (♀) Mean $\pm$ S.D.	5.6 $\pm$ 0.3	5.5 $\pm$ 0.3	5.5 $\pm$ 0.1	5.1 $\pm$ 0.3	T & A = 0.63; T & B = 0.57; T & C = 0.00*; A & B = 0.83; A & C = 0.01*; B & C = 0.05*
Width (♀) Mean $\pm$ S.D. N	7.4 $\pm$ 0.3 13	7.3 $\pm$ 0.3 10	7.6 $\pm$ 0.2 4	6.7 $\pm$ 0.4 11	T & A = 0.60; T & B = 0.15 T & C = 0.00*; A & B = 0.13; A & C = 0.00*; B & C = 0.00*
Tegmen Length (mm) Mean $\pm$ S.D. (♂) N	10.7 $\pm$ 0.6 5	10.9 $\pm$ 0.8 5	6.8 $\pm$ 0.2 8	6.8 $\pm$ 0.6 24	T & A = 0.58; T & B = 0.00* T & C = 0.00*; A & B = 0.00*; A & C = 0.00*; B & C = 0.73
Mean S.D. (♀) N	11.2 $\pm$ 0.4 13	10.4 $\pm$ 0.4 10	7.4 $\pm$ 0.7 4	7.5 $\pm$ 0.5 11	T & A = 0.00*; T & B = 0.00*; T & C = 0.00*; A & B = 0.00*; A & C = 0.00*; B & C = 0.90

DESCRIPTION

In the male, pulvilli occur on the 4 proximal tarsomeres of front and mid legs, and on tarsomeres 3 and 4, or only on 4, of hind tarsus. In the female, pulvilli are present on tarsomeres 1 to 4 of front tarsi (Fig. 18H), 1-4 (rarely 3 and 4) of mid tarsi, and 1-4, 2-4, or 3 and 4 of hind tarsi. Two oothecae are dark reddish brown, surface smooth, keel undulating, with 14 and 17 egg chambers and 16 and 18 keel serrations (Fig. 18E); they measure (height x length), 3.7 x 5.2, and 3.7 x 5.8.

Measurements (♀ in parentheses). Length, 15.1-17.6 (15.6-18.5); pronotum length x width, 4.7-5.3 x 6.5-7.2 (5.1-5.9 x 6.6-7.6); tegmen length, 10.0-12.2 (9.6-11.0).

RACE B

MATERIAL EXAMINED

QUEENSLAND. QMBA: Undarra, Bayliss Cave, 1 ♀ (on floor, halfway in), 22.v.1985, D. Irwin, 1 ♂, 1 ootheca, 22.v.1985, F.D. Stone, 1 ootheca, 15.vi.1985, Howarth, Stone, and J. Bresnan. The following were

collected by Howarth, Stone, and Irwin in Bayliss Cave: 1 ♀, 21.v.1985, 2 ♂♂, 1 ♀ (on floor near low ceiling), 23.v.1985, 1 ♀, 1 ♀ nymph (roots, just before D.U.), 21.v.1985, 5 ♂♂ (1 retained at MCZH), 1 ♀ nymph, 14.vi.1985.

DESCRIPTION

Tegmina further reduced reaching only to middle or hind margin of T3, significantly shorter than the typical morph and Race A (Table 3). Pulvilli present on tarsomeres 1-4 of front and mid tarsi; on hind tarsi pulvilli may be present on 4 proximal tarsomeres, or absent from the first and subobsolete on tarsomeres 2-4.

Measurements (♀ in parentheses): Length, 15.5-17.4 (19.5); pronotum length x width, 4.4-4.8 x 6.2-6.5 (5.4-5.7 x 7.4-7.8); tegmen length, 6.4-7.0 (7.0-8.0).

RACE C

MATERIAL EXAMINED

QUEENSLAND. QMBA: Undarra, Pinwill Cave, 17 ♂♂ (1 with terminalia slide 56), 4 ♀♀, 4 ♂♂ and 7 ♀♀

nymphs, 1 ootheca (1♂, 1♀ retained at MCZH), 20.v.1985, F.G. Howarth, D. Irwin, and F.D. Stone; 1km SE of Yarramulla, E of Mt Surprise, Pinwill Cave, 1♂, 1♀, 11.vii.1984, D. Irwin; Mt Garner, Yarramulla Sta., Pinwill Cave, on floor, 1♂, 1♀ nymph, 18.5.1985, F.G. Howarth; Undarra, Barkers Cave, 4♂♂ (1 with terminalia slide 54), 23.v.1985, 6♀♀, 21.v.1985, Howarth, Irwin and Stone, 1♂, 1♀, 1 ootheca, 15.vi.1985, FGH, FDS, JB, 1♂, 12.vii.1984, D. Irwin.

DESCRIPTION

Tegmina reduced as in *Race B* reaching only to T3 or rarely as far as middle of T5. Pulvilli present on tarsomeres 1-4 of all tarsi. Pinwill Cave specimens are the smallest of all the variants. *Race C* females from Barkers Cave are somewhat larger than those in Pinwill Cave, and their measurements are listed separately (male size is similar in both caves). The ootheca has 14 egg chambers and measures 3.5mm high and 4.8mm long.

Measurements (♀ in parentheses): Pinwill Cave: Length, 12.2-16.6 (15.0-18.0); pronotum length x width, 3.6-4.7 x 5.0-6.1 (4.7-5.0 x 6.0-6.6); tegmen length, 5.8-7.9 (7.0-8.3). Barkers Cave: Length, 14.5-16.6 (18.2-19.7); pronotum length x width, 4.2-4.7 x 5.3-6.1 (5.2-5.6 x 6.7-7.3); tegmen length, 6.2-7.6 (7.0-8.0).

REMARKS

This species is interesting from an evolutionary view of cavernicolous species because of its various races. Whatever the cause for the loss of pulvilli (see earlier discussion), their presence or absence varies in different cave populations. It may well be that the type of cave surface on which the insects walk influences the eventual loss of pulvilli, i.e., certain surfaces may be detrimental for a species with pulvilli and arolia, even though the loss of pulvilli is not necessarily correlated with a cave habitat. There are epigeic species, like *Paratemnopteryx rufa* (Tepper) which essentially lack pulvilli. Loss of arolia also isn't dependent on cave living; the epigeic *Paratemnopteryx glauerti* (Princis) (= *Franwalkeria glauerti*) lacks arolia but has pulvilli.

The variation in pulvilli and arolia negates using them in generic diagnoses in this tribe (Parcoblattini) of cockroaches. In the case of *stonei*, they cannot even be used to separate species. However, *Paratemnopteryx howarthi*, which is cavernicolous, lacks pulvilli and clearly evolved from epigeic *Paratemnopteryx centrulensis* (Roth) which has them (see below).

The parent species of *P. stonei* probably had pulvilli on all 4 proximal tarsomeres of all legs, and *Race C* with pulvilli on all its tarsomeres may be closest to the original stock. The differences in the degree of loss of the pulvilli in the various races may be due to the lengths of time the morphs have been isolated in their respective caves. The typical morphs, which lack pulvilli on all tarsomeres, may have been established in their caves the longest.

There is a marked difference in the size of typical morphs of *stonei* from Royal Arch Cave, and those of *Race C* from Pinwill Cave. Perhaps differences in the kind of available food in the 2 caves account for this variation.

Paratemnopteryx glauerti (Princis) n. comb. (Figs 20A-F, 21A, B, 35)

Franwalkeria glauerti Princis, 1954, p. 34, fig. 32 (♂).
Paratemnopteryx australis (nec Saussure): Tepper, 1896, p. 358 (misidentification).

MATERIAL EXAMINED

HOLOTYPE: ♂ (terminalia slide 8), Merredin, Western Australia; in WAMP

WESTERN AUSTRALIA. ZILS: Norsemen, 1♂ (reported by Princis, 1954, p. 34).

NORTHERN TERRITORY. ANIC: 9km N of Kulgera, 25.46S 133.18E, 1♂ (terminalia slide 82), 2.x.1972, K.H.L. Key *et al.* SAMA: Alice Springs, 1♀, Horn Exped., 1894 (incorrectly reported as *Paratemnopteryx australis* Sauss., by Tepper, 1896, p. 358 (label reads *Paratemnopteryx australis* Sauss. var.?).

QUEENSLAND. SAMA: Cunnamulla, 1♂, 1♀, H. Hardcastle. QMBA: 'Morney', 120km W of Windorah, 1♂, 24.ix.1983, G.B. Monteith.

DESCRIPTION

Male. Eyes extending slightly or not at all below level of antennal sockets, ocellar spots well developed (Fig. 20D). Tegmina and wings fully developed, extending beyond end of abdomen; cubitus vein of hind wing with 3-4 complete and 1-2 incomplete branches, apical triangle absent (Fig. 20F). Front femur Type A3; pulvilli present on 4 proximal tarsomeres, tarsal claws symmetrical, simple, arolia absent. First abdominal tergum with setae along a ridge near anteromedial margin, those in middle partly covered by hind margin of metanotum (Fig. 20C). Seventh abdominal tergum unspecialised. Supraanal plate transverse, hind margin broadly rounded (Fig. 20A); right paraproct with a setose lobe (Fig. 20B). Subgenital plate symmetrical,

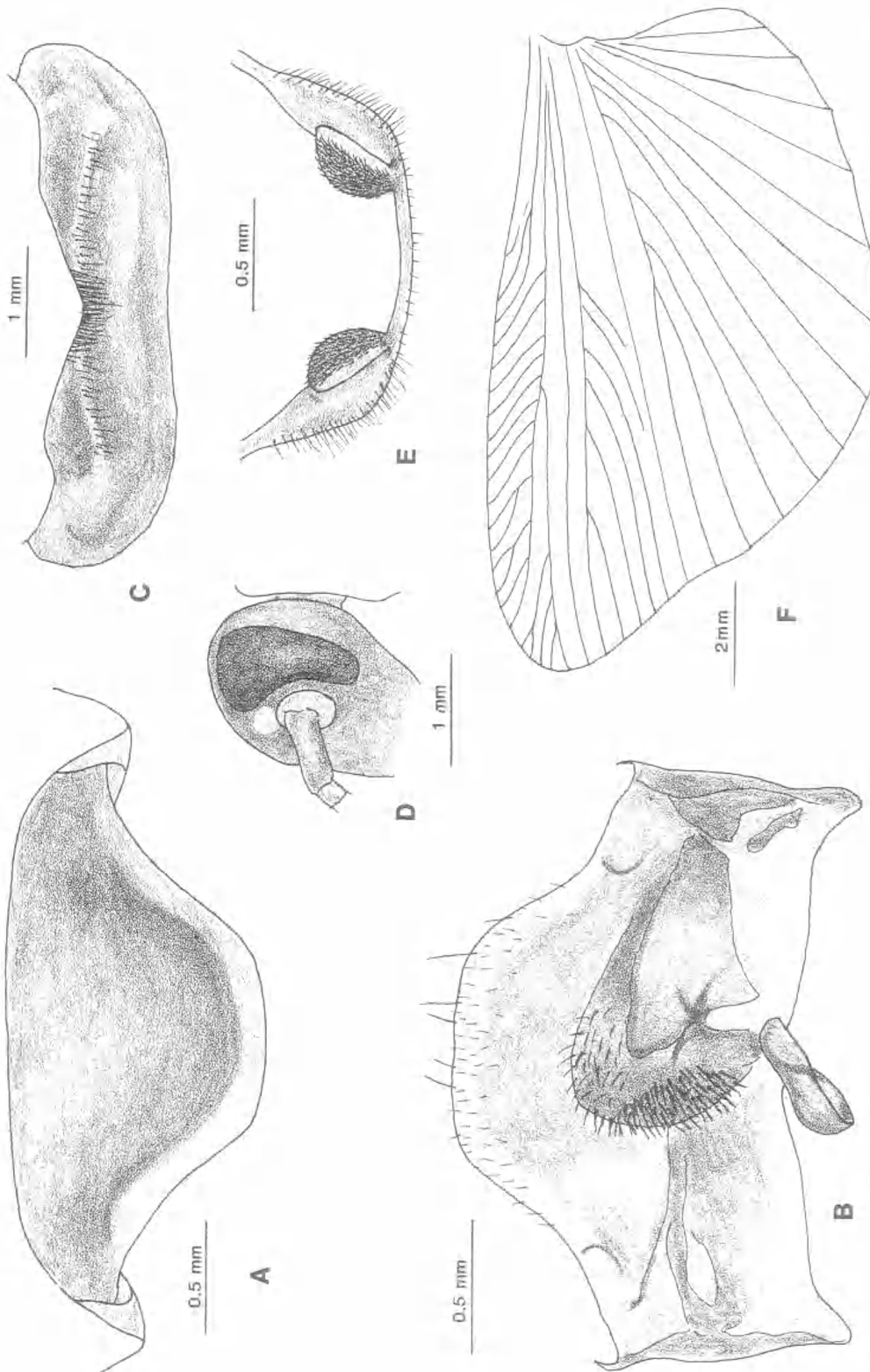


FIG. 20. *Paratemnopteryx glauerti* (Princis). ♂ holotype: A, Supraanal plate (dorsal view); B, Supraanal plate and paraprocts (ventral view); C, First abdominal tergum; D, Eye (lateral view); E, Styles (rear view); F, Hind wing.

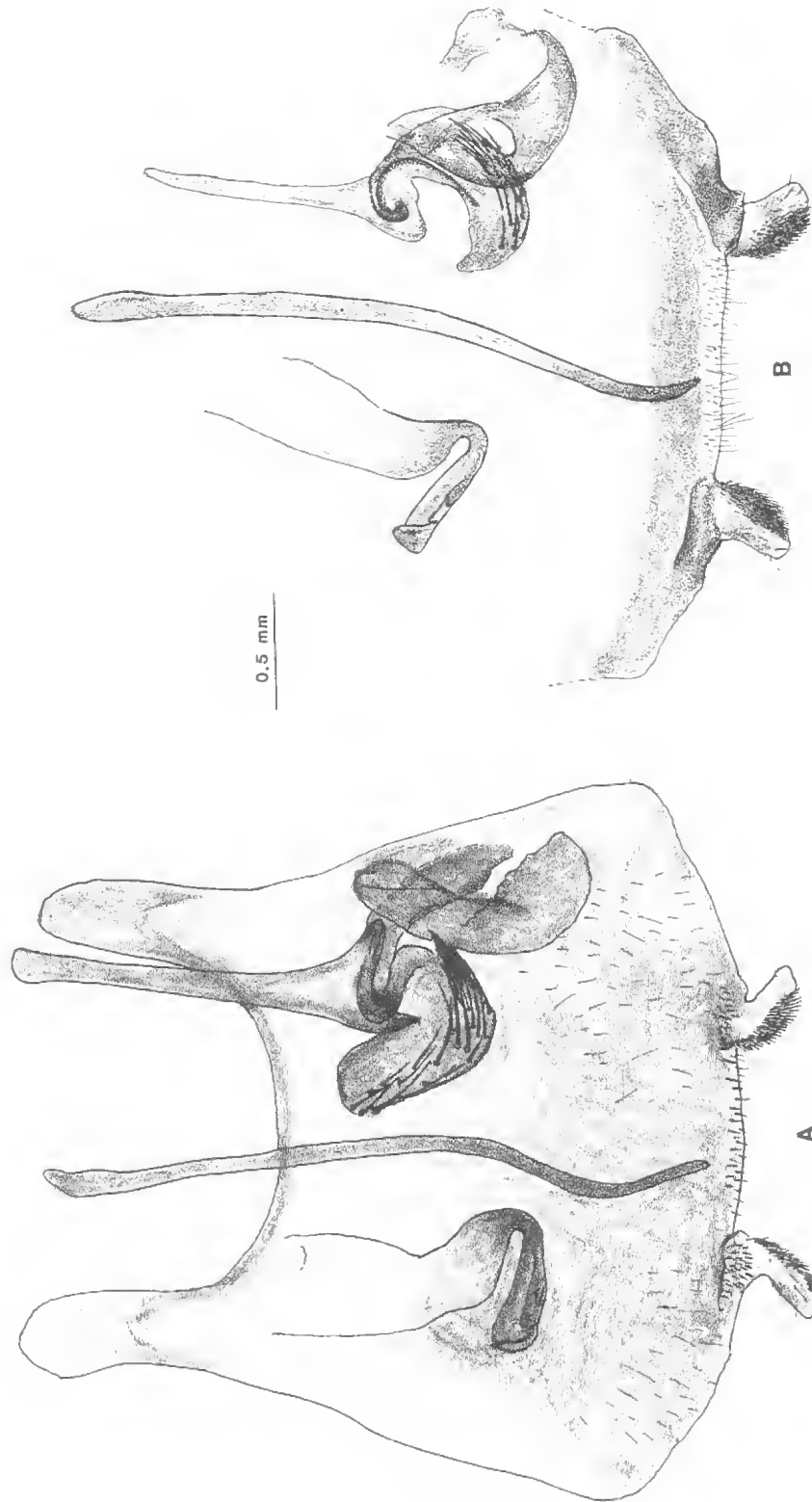


FIG. 21 *Paratennopteryx glauerti* (Princis). A, ♂ holotype, subgenital plate and genitalia (dorsal view); B, ♂, ?variant, Murchison River, W.A., subgenital plate and genitalia (dorsal view).

pilose, styles similar, erect, robust, wide apart (Fig. 20E). Genitalia as in Fig. 21A: hook on left side, with a subapical incision; median phallomere rodlike, unmodified; right phallomere with cleft and spined sclerites.

Colouration. Brown. Head with face darker brown than vertex. Terminal abdominal terga darker, supraanal plate with flattened hind border region yellowish brown (Fig. 20A). Coxae with basal regions dark brown, remaining parts of legs lighter. The male from Northern Territory is darker than the holotype, its head is uniformly dark brown, pronotal disk with light brown mark, posterior border zones darker than lateral regions.

Female. Habitus essentially similar to females of *couloniana*, but somewhat larger. Tegmina reduced reaching only to T2; hind wings much smaller. Genitalia similar to that of *couloniana*, with right paratergite enlarged (as in Fig. 17G).

Measurements (♀ in parentheses). Length, 14.0-19.0 (19.5-20.5); pronotum length x width, 3.9-5.1 x 5.4-7.3 (5.5-5.7 x 7.7-8.5); tegmen length, 13.5-18.0 (8.2).

?VARIANT

MATERIAL EXAMINED

WESTERN AUSTRALIA. ANIC: Murchison River, 27.49S 114.41E, 1♂ (terminalia slide 81), 28.iii.1971, E.F. Riek.

DESCRIPTION

Male. This specimen appears to be a very small *glauerti*. It is dark reddish brown, head uniformly dark except for pale clypeus, supraanal plate unicolourous its hind border not yellowish. Styles and genital phallomeres similar to those of the type, the right phallomere showing minor differences (cp. Fig. 21A,B).

Measurements. Length, 13.2; pronotum length x width 3.6 x 5.1; tegmen length, 12.2.

REMARKS

Paratemnopteryx glauerti is very close to *P. couloniana* and can be distinguished from it by the shape of the supraanal plate. However, it is essentially a *couloniana* that has lost its arolia. The absence of arolia also separates the females of the two taxa. It is possible that the 2 females with reduced tegmina which I have determined as *glauerti* are female *couloniana* that apparently lack arolia.

Paratemnopteryx atra Princis (Figs 22A-H, 35)

Paratemnopteryx atra Princis, 1963, p. 11, fig. 2 (♂ and ♀); Richards, 1967, pp. 37, 38, 41.

MATERIAL EXAMINED

HOLOTYPE. ♂ (terminalia slide 6), Marble Bar, Western Australia, 21.07S 119.41E, 10.x.1957, collected deep in mines on piles of dung of the bat *Macroderma gigas*, A.M. Douglas; in WAMP.

PARATYPES. WESTERN AUSTRALIA. WAMP: same data as holotype, 4♂♂ (1 incorrectly labelled ♀), 1♀ (genitalia slide 7).

ADDITIONAL MATERIAL. WESTERN AUSTRALIA. WAMP: same data as holotype, 1♀, 1♀ nymph.

DESCRIPTION

Male. Eyes reduced, not extending below level of antennal sockets (Fig. 22B), ocellar spots present. Pronotum flat, parabolic (Fig. 22A). Tegmina slightly reduced, width normal, tapering towards rounded apex, not reaching end of abdomen (Fig. 22A); hind wings vestigial, lateral, membranous, reaching between T1 and T2. Front femur Type A3, pulvilli and arolia absent, tarsal claws symmetrical, simple. First abdominal tergum with a medial group of setae along anterior margin, completely or incompletely covered by metanotum (Princis incorrectly stated that all terga are unspecialised). Seventh abdominal tergum unspecialised. Supraanal plate trigonal, hind margin broadly rounded (Fig. 22D); paraprocts dissimilar, right one with large setose lobe, left one with spinelike process (Fig. 22E). Subgenital plate symmetrical, convex, styles similar, symmetrically placed, wide apart (Fig. 22C). Genitalia as in Fig. 22F: hook on left side with subapical incision; median phallomere rodlike, apex unmodified; right phallomere with spined sclerite.

Colouration. Black or black with reddish tinge.

Female. Supraanal plate with hind margin concavely excavated (Fig. 22G). Genitalia as in Fig. 22H: right paratergite with an enlarged swelling (arrow).

Measurements (♀ in parentheses). Length, 19.0-25.5 (23.5-26.5); pronotum length x width, 7.3-7.7 x 10.0-10.4 (8.1-8.8 x 11.7-12.5); tegmen length, 16.4-18.0 (17.2-17.3).

REMARKS

This, a true guanobe, is the largest species of cavernicolous *Paratemnopteryx*. It is closely related to *P. couloniana*.

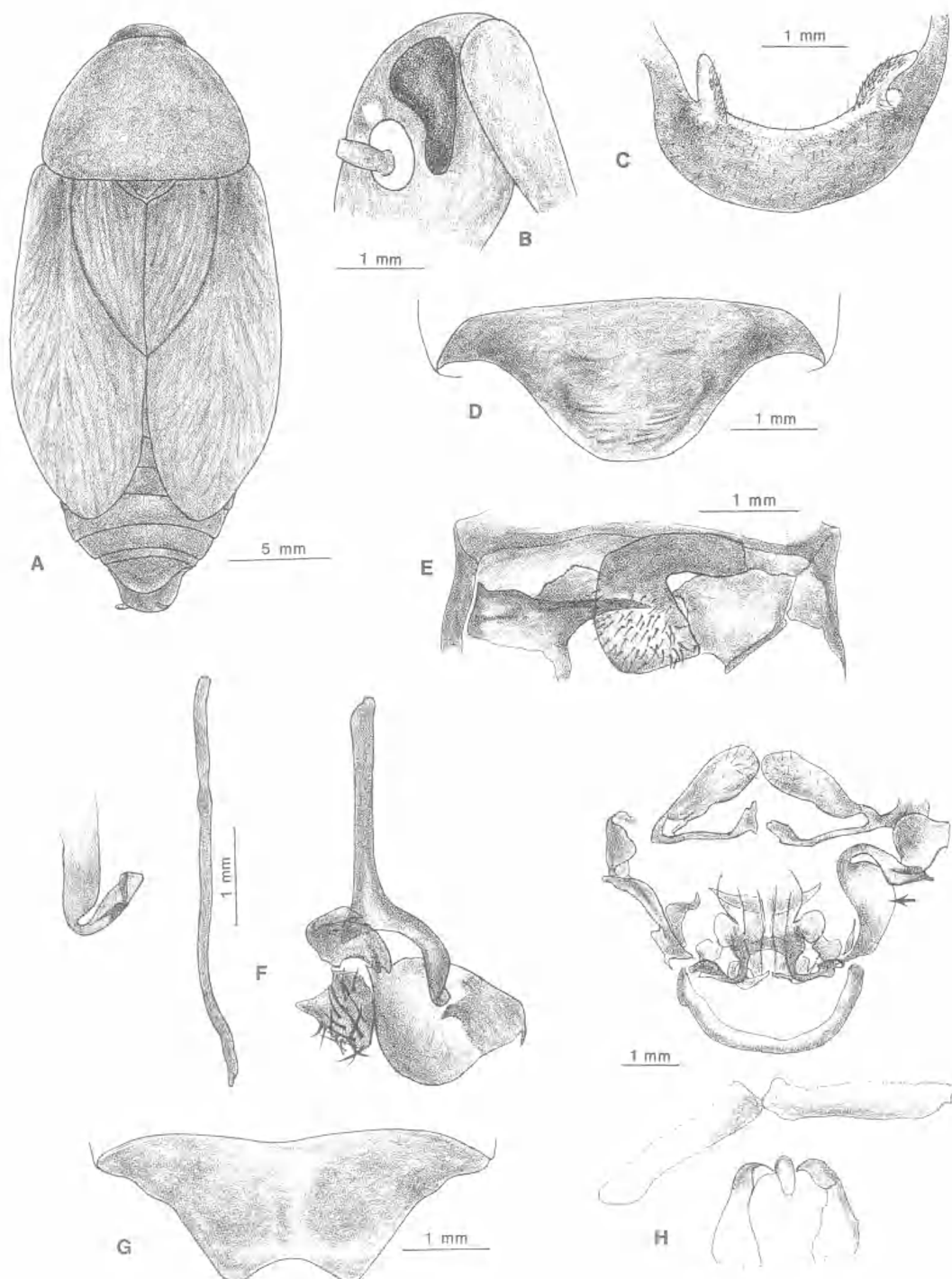


FIG. 22. *Paratempnopteryx atra* Princis from Marble Bar, W.A.: A-F, ♂♂: A, habitus; B, Eye (lateral view); C, subgenital plate and styles (rear-oblique view); D, Supraanal plate (dorsal view); E, Paraprocts (ventral view); F, Genitalia (dorsal view); G, H, Females: G, Supraanal plate (dorsal view); H, Genitalia (ventral view; arrow indicates expanded region of right paratergite), E, F, holotype, others paratypes.

***Paratemnopteryx australis* Saussure**
(Figs 23A-D, 35)

Paratemnopteryx australis Saussure, 1869, p. 273, pl. 3, fig. 22 (♀); Walker, 1871, p. 18; Tepper, 1894, p. 170; Kirby, 1904, p. 106; Shelford, 1908b, p. 9; Alexander, 1917, p. 98; Princis, 1954, p. 35; Roth, 1968, pp. 84, 110, fig. 141 (ootheca).

HOLOTYPE (not examined)

♀, Melbourne (Victoria), Australia; the type apparently is not in the MHNG; I received only 1 ♀ specimen from the Geneva Museum, supposedly of this species, but it was from Peak Downs, Queensland.

MATERIAL EXAMINED

WESTERN AUSTRALIA. WAMP: 11 km SSE of Banjiwarr HS., 27.42S 121.37E, 1 ♀ (carrying rotated ootheca), ex pitfall trap, 22-28.ii.1980, T.F. Houston *et al.*, Biol. Survey Site BWR1; 6.8 km NNW of Mt Linden, 29.19S 122.25E (with detached ootheca), 1 ♀, 17-23.iii.1979, T.F. Houston *et al.*, Biol. Survey Site YMR2; Yandil, 1 ♀, 1928 (reported by Princis, 1954, p. 35); Kathleen Valley, 1 ♀, 1963, T. Moriarty; Barrow Island, ex *Nusutermes triodiae* nest, 1 ♂ (terminalia slide 11), 12.v.1982, C.N. Smithers and W.H. Butler, 1 ♀ nymph, 16.ii.1982, C.N. Smithers.

DESCRIPTION

Male. Eyes reduced, not extending below antennal sockets, interocular space less than distance between antennal sockets. Tegmina reduced in length reaching to about hind margin of T2, width normal, touching at midline, distal margin truncate, corners rounded; hind wings vestigial, narrow, lateral, reaching to about hind margin of T1. Front femur Type A3; tarsal claws simple, symmetrical, pulvilli and arolia absent. First abdominal tergum with a few setae medially on anterior margin, mostly hidden by overlapping hind margin of metanotum, only their tips visible. Seventh abdominal tergum unspecialised. Supraanal plate with sides concave, tapering, hind margin shallowly concave, corners rounded, a distinct transverse groove near basal margin (Fig. 23A); right paraproct much larger than left, composed of 3 sclerites one of them roundly bulbous and partially spined (Fig. 23C). Subgenital plate symmetrical, sides upturned, styles elongate, similar, upright (Fig. 23B), each located in posterolateral corners of plate, interstylar margin straight (Fig. 23D). Genitalia as in Fig. 23D: hook on left side with subapical incision; median phallomere slender, apex slightly enlarged, rounded; right phal-

lomere with a cleft sclerite and small number of spines or setae.

Colouration. Dark reddish brown.

Female. Supraanal plate trigonal, apex rounded. Tegmina, hind wings, legs, and colouration as in male.

Measurements (♀ in parentheses). Length, ? (16.9-20.5); pronotum length x width, ? (4.7-5.8 x 6.3-8.4); tegmen length, 6.5 (4.5-6.0).

The following is Saussure's description of the female of *P. australis*. Head smooth. Pronotum semicircular, slightly convex, with traces of grooves, lateral borders deflexed, posterior angles slightly rounded, hind border weakly arched, slightly projecting medially. Tegmina terminating on second abdominal tergum and touch or cross each other along their inner borders, apex attenuated, rounded, nearly semicircular at apex; veins visible, anal field elongated reaching to four fifths of sutural border showing 6-7 axillary veins; anal groove strongly sinuate. Wings rudimentary. Legs greatly compressed, tarsi elongated and spined over their lengths, arolia absent. Hind borders of abdominal terga straight, lateral borders weakly serrated. Supraanal plate triangular, apex slightly prolonged and rounded. Cerci large, flattened, fusiform.

Colouration. Brownish black. Antennae brownish black provided with gray hairs. Head with mouth, ocellar spots, antennal sockets, brownish yellow. Tegmina chestnut brown. Legs and abdomen basally brown to brownish yellow, tibiae darker brown.

Measurements. Length, 16.0; pronotum length x width, 5.0 x 7.0; tegmen length, 6.5.

The female from the Geneva Museum which was sent to me as *Paratemnopteryx australis*, from Peak Downs, Queensland, is smaller than Saussure's specimen from Melbourne, or the material from Western Australia and is as follows:

Eyes reduced, reaching level of antennal sockets, interocular space slightly greater than distance between ocellar spots. Front femur Type A3; pulvilli and arolia absent. Tegmina reduced, width normal; hind wings vestigial, reaching hind margin of metanotum. Supraanal plate trigonal, apex rounded. Head dark brown, clypeus and labrum lighter brown. Pronotum reddish brown. Tegmina lighter reddish brown. Abdominal terga and cerci blackish, with metallic sheen. Legs reddish brown, cerci darker.

Measurements. Length, 11.5; pronotum length x width, 3.5 x 5.0; tegmen length 4.3.

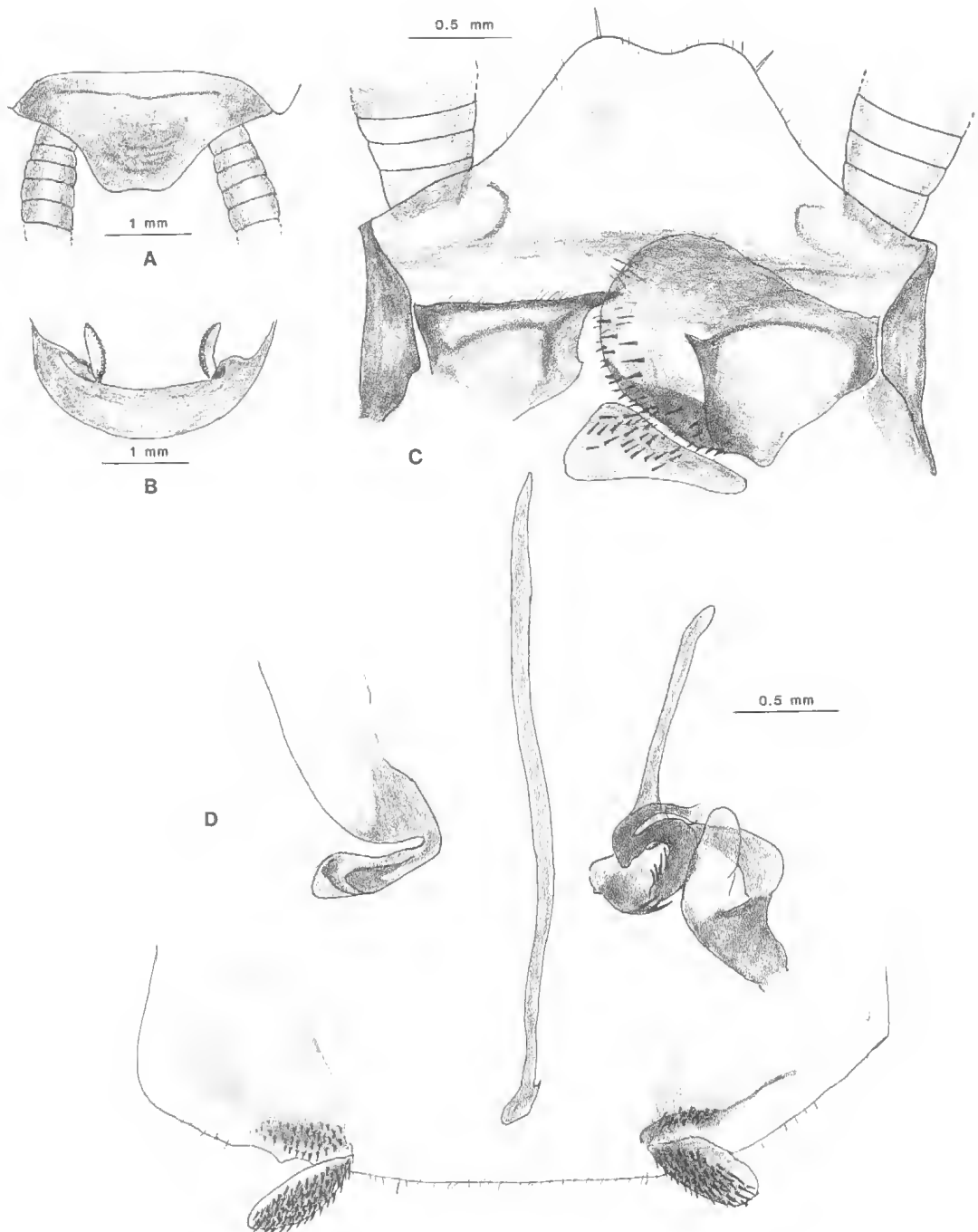


FIG. 23. *Paratemnopteryx australis* Saussure, ♂ from Barrow Island, W.A.: A, Supraanal plate (dorsal view); B, Subgenital plate and styles (rear-oblique view); C, Supraanal plate and paraprocts (ventral view); D, Styles and genitalia (dorsal view).

REMARKS

The male from Western Australia which Princis determined as *Paratemnopteryx australis*, and which I have described here as that species, differs from the male of *Paratemnopteryx rufa*, principally in the shape of the supraanal plate, paraprocts, and in the apex of the median genital phallomere. The females are similar and I doubt if they can be distinguished, unless collected with males. Colour is of little significance because it can be so variable. In general the specimens which I have described as *rufa* are larger than those of *australis*, but here too size in this group of cockroaches can be extremely variable.

It is possible that *australis* and *rufa* are conspecific. They clearly are very close taxonomically. Establishing cultures of specimens from different localities, especially topotypic material, and studying their biology, would help in deciding whether *rufa* is a valid species.

***Paratemnopteryx rufa* (Tepper)**
(Figs 24A-G, 25A-F, 35)

Periplaneta rufa Tepper, 1893, p. 101 (♂); in Horn, 1896, p. 363.

Blatta rufa (Tepper): Kirby, 1904, p. 139; Shelford, 1910, p. 16.

Blatta tepperana Gurney, 1942, p. 24 (footnote); Princis, 1969, p. 733.

Paratemnopteryx rufa (Tepper): Princis, 1954, p. 35 (♀).

Paratemnopteryx zeitzi Tepper, 1895a, p. 20 (♂). N. Syn.

?*Paratemnopteryx zeitzi* Tepper: Princis, 1969, p. 733.

MATERIAL EXAMINED

HOLOTYPE: ♂ (terminalia slide 49), Oodnadatta, Central Australia (=South Australia), F. Juncken; in SAMA.

SOUTH AUSTRALIA. SAMA: ♂ (terminalia slide 50) lectotype (here designated) of *Paratemnopteryx zeitzi* Tepper, L.(ake) Callabonna, far north South Australia, A. Zeitz, 1893.

NEW SOUTH WALES. ANIC: near Milparinka, 1♀, 5.i.1967, collected as nymph, xi.1966, under rock in 7" rainfall country, M.F. Day.

QUEENSLAND. QMBA: 30km east of Betoota, SW Qld, 3♂♂, 3♀♀, 25.ix. 1983, G.B. Monteith.

DESCRIPTION

Male. Eyes reduced not extending below antennal sockets, interocular distance greater than space between small ocelliform spots and antennal sockets (Figs 24B, 25B). Pronotum smooth, parabolic, weakly convex (Figs 24A, 25A). Tegmina normal in width, reduced in length reaching to about hind margin of T2, distal margin obliquely truncate or subtruncate, veins visible; hind wings vestigial, lateral, membranous, not reaching hind margin of T1 (Fig. 25A). Front femur Type A3; pulvilli absent or subobsolete (in ventral view pulvilli may be represented by lightly sclerotised areas bordered by several large spines, at the apices of 4 proximal tarsomeres), tarsal claws simple, arolia absent. First abdominal tergum with few short setae arranged in longitudinal row near anterior margin of segment, hidden by hind margin of metanotum. Seventh abdominal tergum unspecialised. Supraanal plate transverse, hind margin subtruncate (Figs 24E, 25C), or weakly convexly rounded; paraprocts dissimilar as in Fig. 24E. Subgenital plate almost symmetrical, styles, elongate, upright, partially covered by dense, dark setae, interstyler margin almost straight (Figs 24C, D, F, 25D, E). Genitalia as in Fig. 24G, 25F: hook on left side with a subapical incision; median phallomere slender, apically unmodified; right phallomere with a cleft and setose sclerite.

Colouration. Shiny, reddish brown or dark brown to blackish brown.

Female. Supraanal plate trigonal, apex broadly rounded. The specimen from near Milparinka, NSW is light chestnut brown.

Measurements. See Table 4.

	Length	Pronotum		Tegmen	
		length	width	length	width
♂ holotype <i>rufa</i>	22.0?	6.0	9.4	8.0	6.0
♂ lectotype <i>zeitzi</i>	21.0	5.8	7.9	6.1	5.4
Queensland ♂♂	23.0-24.0	6.5-7.4	10.3-10.8	8.0-8.3	6.4-6.5
♀♀	29.-30.0	7.4-7.5	10.2-11.0	7.7-9.0	6.1-6.7
New South Wales ♀	26.0	7.3	10.2	8.0	6.3

TABLE 4. Comparative measurements of *Paratemnopteryx rufa*.

REMARKS

According to Tepper (1893, p.102), 'Mr. F. Juncken, ... mentioned in one of his letters that cockroaches proved rather annoying.' At

Tepper's request he sent him a single male on which the description of *rufa* was based. Presumably if these cockroaches were annoying, they are found in houses. But it is doubtful that

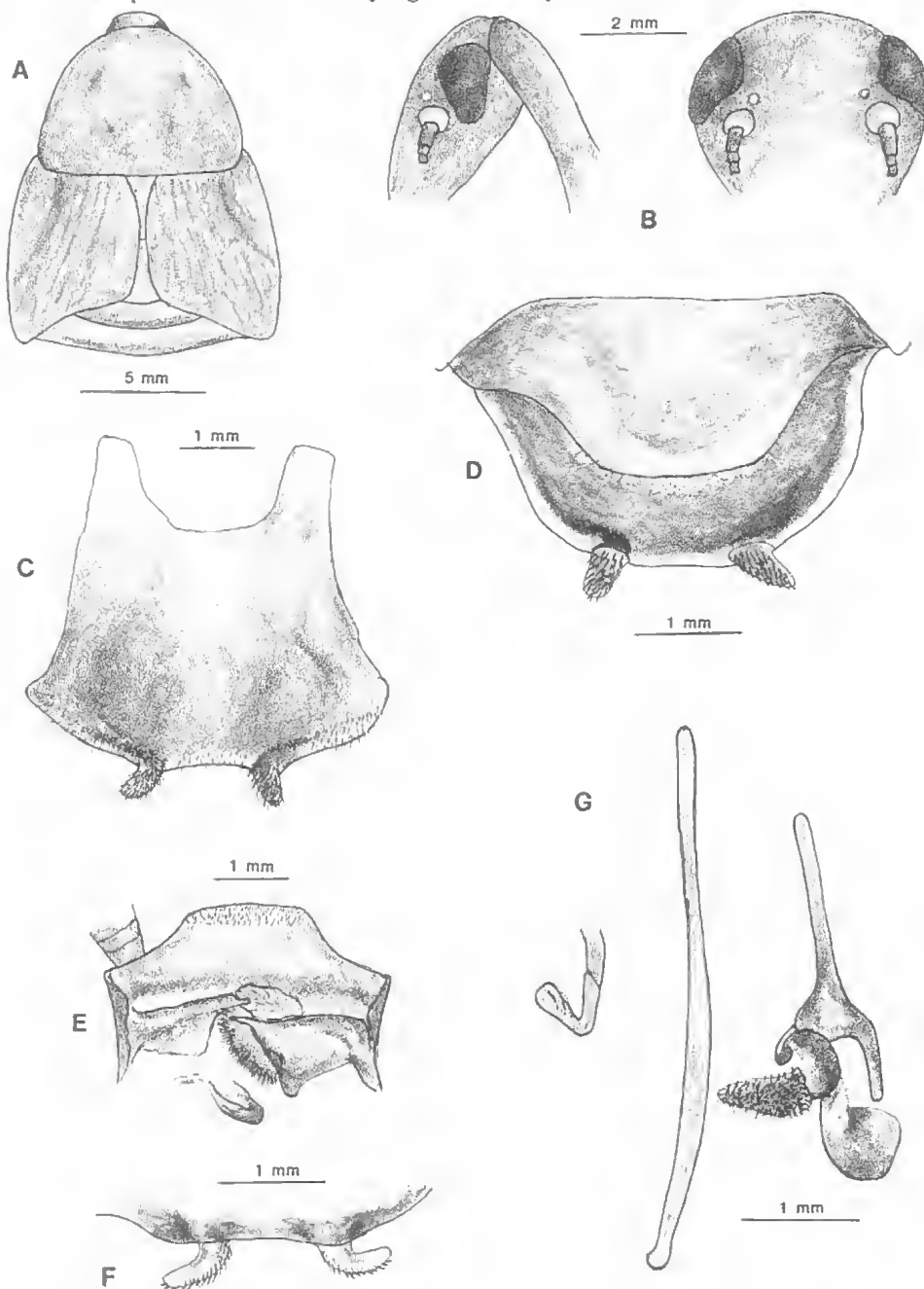


FIG. 24. *Paratemnopteryx rufa* (Tepper), ♂ holotype: A, Pronotum and tegmina; B, Eyes (lateral and frontal views); C, Subgenital plate and styles (dorsal view); D, Supraanal and subgenital plates (dorsal view); E, Supraanal plate and paraprocts (ventral view); F, Styles (ventral view); G, Genitalia (dorsal view).

the 'annoying' cockroaches were *Paratemnopteryx*. A second specimen (in SAMA), from New Hebrides, which Tepper identified as *Periplaneta rufa*, actually is a male nymph of *Periplaneta americana* which is an annoying

domiciliary pest. Superficially nymphs of *P. americana* resemble *Paratemnopteryx rufa*, but they have well developed pulvilli and arolia, and the male subgenital plate and styles are typical of a *Periplaneta*.

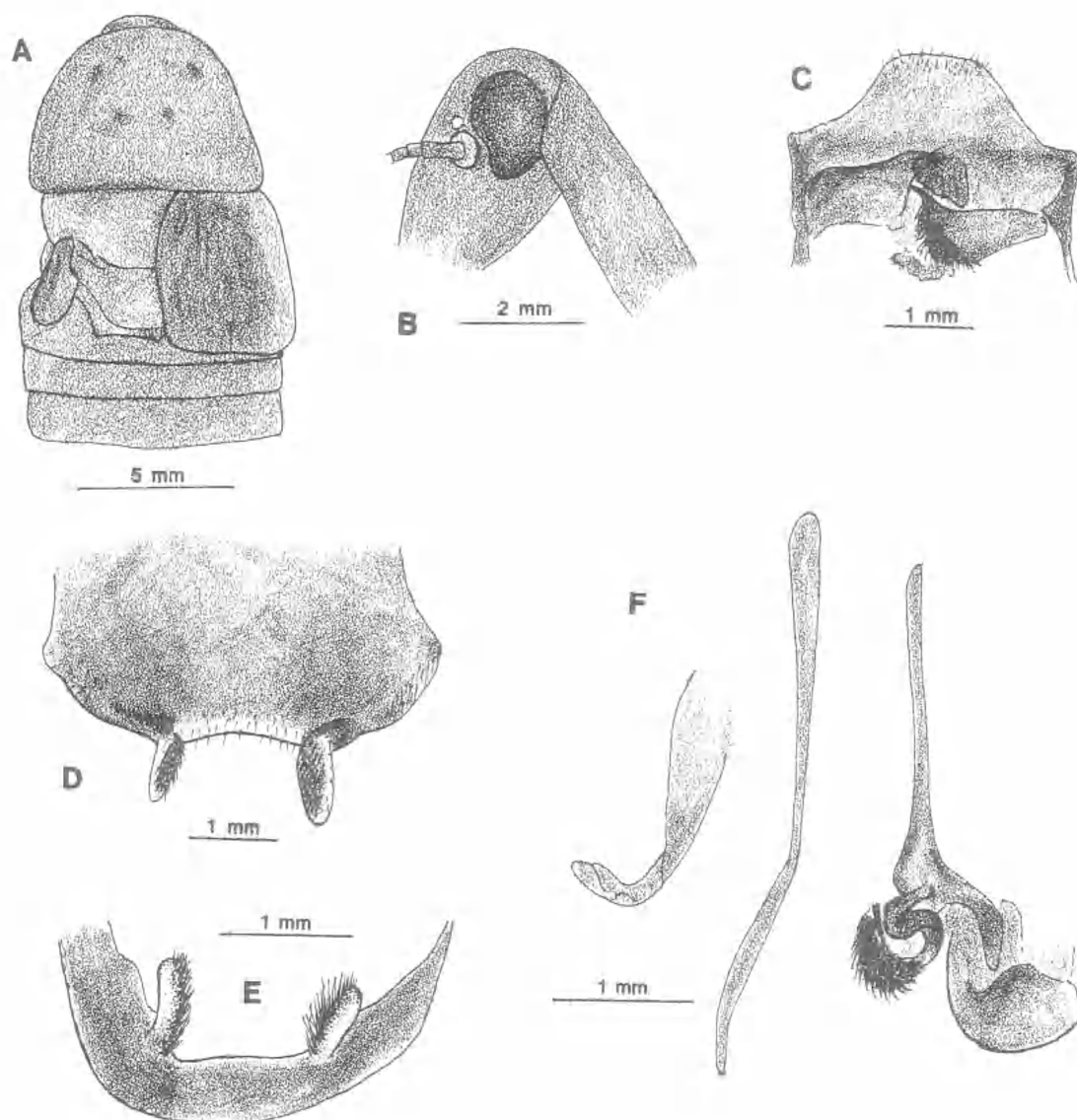


FIG. 25. *Paratemnopteryx rufa* (Tepper), ♂ lectotype of *Paratemnopteryx zeitzi* Tepper: A, Thorax, tegmina (left one removed to show vestigial hind wing), and first 3 abdominal terga; B, Eye (lateral view); C, Supraanal plate and paraprocts (ventral view); D, Distal part of subgenital plate and styles (dorsal view); E, Styles (rear view); F, Genitalia (dorsal view).

***Paratemnopteryx* sp. 1**
(Fig. 26A-C)

MATERIAL EXAMINED

QUEENSLAND. ANIC: The following were collected by S.R. Morton: 10km north of Sandringham Stn Homestead, at seed bait, Sandridge, 2♂♂ (1 with terminalia slide 49), 20.ii.1980, 1♂, 1♀, 21.ii.1980; 10km west of Sandringham, 1♀, 12.i.1979; Sandringham Stn, 1♀ nymph, 24.i.1979. QMBA: Birdsville, SW Qld, ex pitfall trap 2♂♂, 1 nymph, 11-17.xi.1976, D. McGreedy; Canterbury, 90km W of Windorah, southwest Qld, 1♀, 27.ix.1983, G.B. Monteith.

NORTHERN TERRITORY. ANIC: 15km south of Alice Springs, bat caves, pitfall trap 60m from entrance, 1♀, 2 nymphs, 15.vi.1976, G. Griffin; 26km WSW of Mulga Park H.S., 26.00S 131.25E, 1♀ (genitalia slide 83), 18.i.1982; D.C.F. Rentz, B.G.F. Rentz, and R. Honeycutt, Stop 10.

DESCRIPTION

Male. Eyes reduced not reaching below level of antennal sockets, interocular space slightly greater than that between sockets. Pronotum sub-parabolic. Tegmina reaching to T2, width normal, veins distinct. Hind wings vestigial

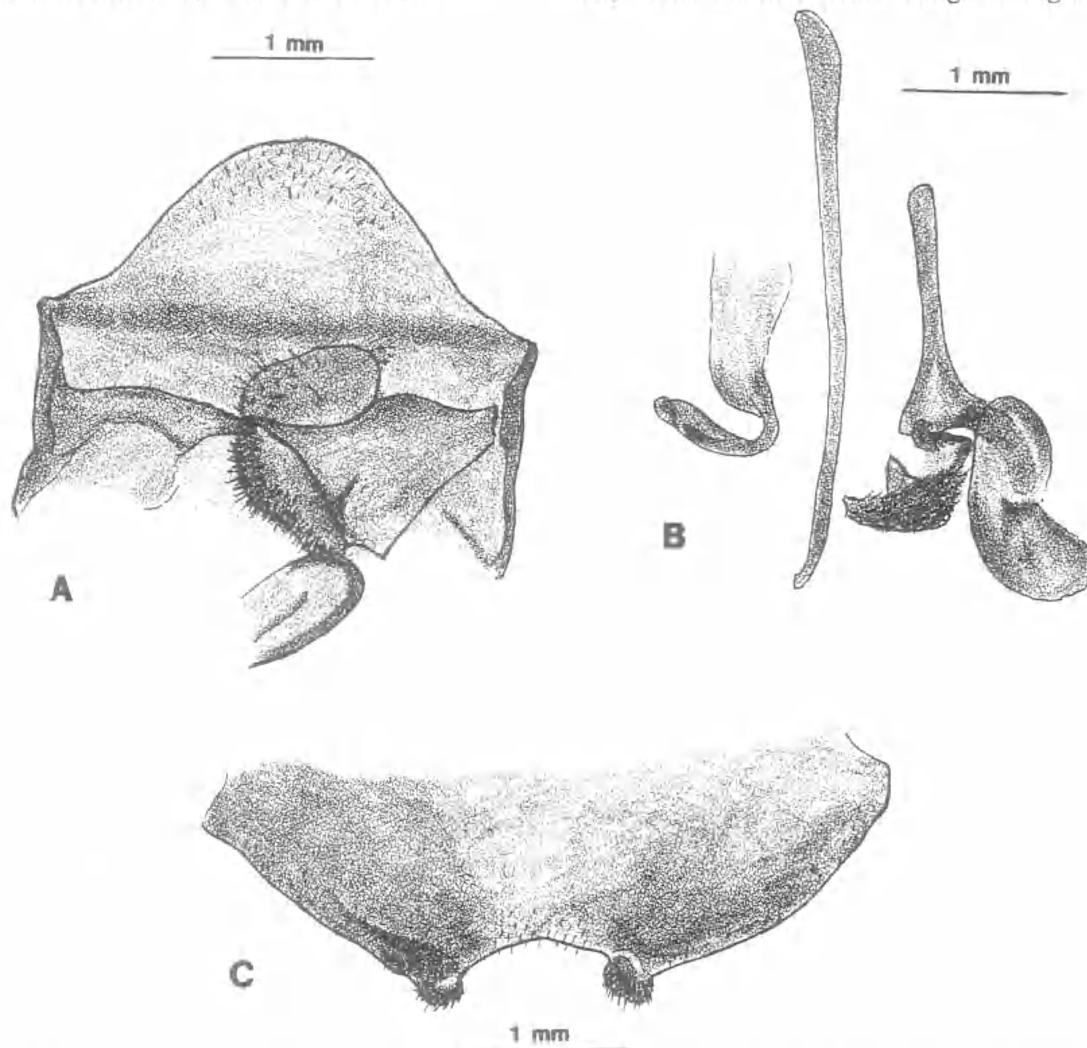


FIG. 26. *Paratemnopteryx* sp. 1, ♂ from 26 km WSW of Mulga Park H.S., Northern Territory: A, Supraanal plate and paraprocts (ventral view); B, Distal part of subgenital plate, and styles (dorsal view); C, Genitalia (dorsal view).

reaching T1. Front femur Type A3 (rarely A4); arolia absent, pulvilli variable, absent or subobsolete on tarsomeres 2 to 4. First abdominal tergum with row of short setae along anterior margin medially, covered by hind margin of metanotum. Seventh abdominal tergum unspecialised. Supraanal plate broadly rounded, right paraproct with setose plate (Fig. 26A). Subgenital plate symmetrical, styles short, widely spaced, erect or curved ventrad around hind margin of plate, interstyler margin weakly concave or straight (Fig. 26C). Genitalia as in Fig. 26C.

Colouration. Light reddish brown.

Female. Supraanal plate trigonal, broadly rounded. Females may be much darker than males. The female from Canterbury is the darkest with head black except for yellowish brown clypeus, brown labrum; pronotum black; tegmina dark reddish brown; abdominal terga and cerci black, abdominal sterna and legs reddish brown.

Measurements (♀ in parentheses). Length, 18.0-19.7 (18.0-22.0); pronotum length x width, 4.8-5.8 x 6.5-8.0 (5.2-6.1 x 7.2-8.5); tegmen length x width, 5.7-6.3 x 4.3-5.2 (5.1-8.3 x 4.4-5.5).

REMARKS

This species appears to combine characters of *australis* and *rufa*. Its size, and shape of male supraanal plate are more like those of *australis* (Fig. 23C) although it is not indented medially. The right paraproct and median and right genital phallomeres are similar to *rufa* (Fig. 24E,G). This may prove to be a distinct taxon. However, I have not seen the type of *australis* and, at least, topotypic specimens (Melbourne) should be examined before deciding this question.

Paratemnapteryx broomehillensis n. sp. (Figs 27A-G, 28A,B, 35)

MATERIAL EXAMINED

HOLOTYPE: ♂, Broomehill, Western Australia, 33.51S 117.38E, MV light trap, 9.ii.1985, R.P. McMillan; in WAMP.

PARATYPE: WESTERN AUSTRALIA. ANIC: Wanneroo, 1 ♂, (terminalia slide 136), 1.i.1964, G.S. McCutcheon.

DESCRIPTION

Male. Eyes fully developed extending below level of antennal sockets; interocular space less than distance between antennal sockets. Pronotum with lateral margins posterior to middle weakly oblique (Fig. 27G). Tegmina and wings fully developed extending well beyond

end of abdomen; cubitus vein of hind wing with 3-4 complete and 4 incomplete branches, apical triangle absent. Front femur Type A3; pulvilli present on 4 proximal tarsomeres, tarsal claws simple, symmetrical, arolia present. First abdominal tergum with large anteromedial transverse depression bordered by rounded elevation bearing very small spaced setae, these also present on either side of depression (setae not in dense group) (Fig. 27C,D). Seventh abdominal tergum with large group of dense, black setae in shallow depression medially on anterior half of segment, partially covered by T6 (Fig. 27A,B). Supraanal plate produced, sides concave, hind margin with deep U-shaped excavation forming pair of apically rounded lobes bearing long slender setae dorsally, densely covered with small dark spines ventrally (Figs 27B, 28A); ventral intercercal ridge absent, or at most represented by transverse, unpigmented, shallow elevation; right paraproct with very large spinelike process (Fig. 28A). Subgenital plate symmetrical, styles similar, elongated, tapering, upright, bearing small, densely packed dark spines on one surface, each style located in posterior corners of plate, below cerci, interstyler margin convex (Figs 27B,E,F, 28B). Genitalia as in Fig. 28B: hooklike phallomere on left side, with subapical incision; median phallomere rodlike, apex acute; right phallomere with cleft-like sclerite.

Colouration. Light brown. Pronotum hyaline on posterior half lateral to disk, and along hind border.

Female. Unknown.

Measurements. Length, 21.0-23.9; pronotum length x width, 5.7-6.0 x 7.2-7.6; tegmen length, 22.1-23.8.

REMARKS

The general appearance of *broomehillensis* is that of a *Neotemnapteryx*, but the shape and position of the styles are typical of most species of *Paratemnapteryx*. The apex of the median genital phallomere resembles that found in *P. centralensis* (Fig. 29B). The shape of the supraanal plate of *broomehillensis* readily distinguishes it from all other species of *Paratemnapteryx*, or of *Neotemnapteryx*.

Paratemnapteryx sp. 2

MATERIAL EXAMINED

NEW SOUTH WALES. Lord Howe Island, Ned's Beach, 1 ♀ (genitalia slide 84), xii.1972. Z. Liepa.

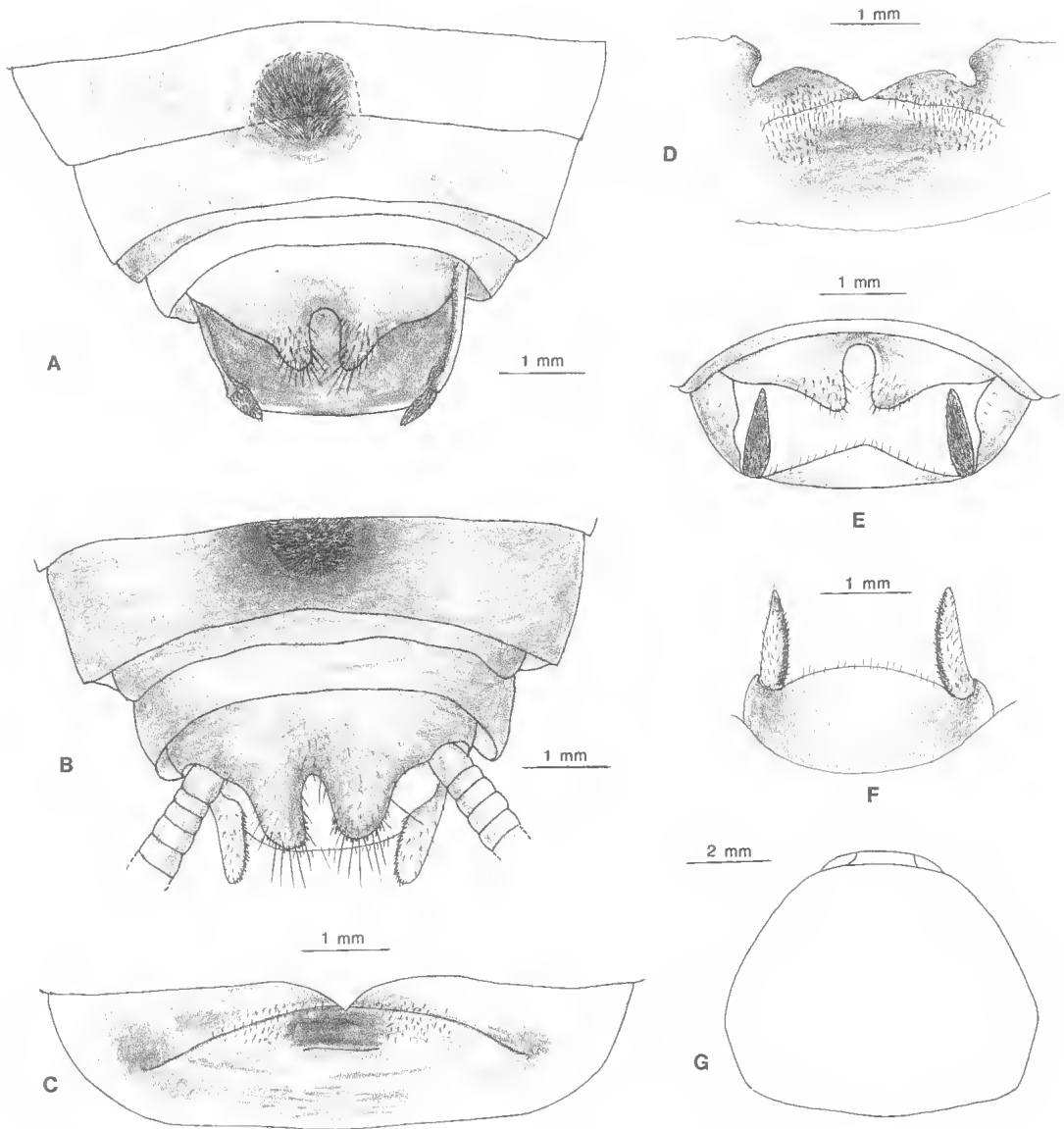


FIG. 27. *Paratemnopteryx broomehillensis*, n. sp. ♂♂: A, Abdominal terga 6 to 10 (supraanal plate), and subgenital plate (part of T6 removed to show setal gland on T7); B, Abdominal terga 7 to supraanal plate; C, First abdominal tergum; D, Glandular region on T1; E, Supraanal and subgenital plates (rear view); F, Subgenital plate and styles (ventral view); G, Pronotum. Localities: A, C, E, G, paratype from Wannaru, W.A.; B, D, F, holotype from Broomehill, W.A.

DESCRIPTION

Female. Eyes reduced, interocular space greater than distance between small, distinct ocellar spots, and antennal sockets. Tegmina reduced in length, width normal, reaching to T7, tapering

to a rounded apex. Hind wings slightly smaller, reaching to T6, cubitus vein with 4 complete and 2 incomplete branches, apical triangle absent. Front femur Type A3; tarsal claws simple, symmetrical, pulvilli absent, arolia very small.



FIG. 28. *Paratemnopteryx broomehillensis*, n. sp. ♂ paratype from Wanneroo, W.A.; A, Supraanal plate and paraprocts (ventral view); B, Styles and genitalia (dorsal view).

Colouration. Head reddish brown, lighter on vertex and clypeal region. Pronotum and tegmina light reddish brown. Wing with yellowish tinge. Abdominal terga and sterna dark brown. Legs light brown.

Measurements. Length, 13.2; pronotum length x width, 4.8 x 6.8; tegmen length, 9.0.

Paratemnopteryx sp. 3

MATERIAL EXAMINED

QUEENSLAND. ANIC: Noccundra, 1 ♀, 8.xi.1949, E.F. Riek.

DESCRIPTION

Female. Interocular space less than distance between ocellar spots, about same as space between antennal sockets. Pronotum transverse, anterior margin straight, hind margin weakly convex, lateral margins obliquely convex. Tegmina reduced in length reaching T2, width normal, apex rounded, veins distinct. Hind wings vestigial, lateral, reaching hind margin of T1. Front femur Type A3; pulvilli present on fourth tarsomere only, tarsal claws symmetrical, simple, arolia absent. Supraanal plate trigonal, broadly rounded.

Colouration. Head dark reddish brown, ocellar spots distinct, yellowish white, clypeus yellowish, labrum light brown. Pronotum reddish brown, disk lighter. Tegmina light reddish brown. Abdominal terga with basal 2 segments light reddish brown, remainder blackish. Abdominal sterna reddish brown becoming darker on posterior segments. Cerci blackish. Legs light brown.

Measurements. Length, 16.0; pronotum length x width, 4.5 x 6.8; tegmen length, 6.5.

Paratemnopteryx sp. 4

MATERIAL EXAMINED

QUEENSLAND. QMBA: Undarra, Bayliss Cave, on floor beyond Duckunder, 1 ♀, 1 ♀ nymph, 23.v.1985, F.G. Howarth, D. Irwin, and F.D. Stone.

DESCRIPTION

Female. Ocelli and eyes absent. Tegmina reduced in length, width normal, reaching to about hind margin of T3, anterior margin strongly convex, apex rounded. Hind wings vestigial, narrow, lateral, reaching to hind margin of T2, some venation visible. Femur Type A3; pulvilli and arolia absent. Supraanal plate trigonal, lateral margins shallowly concave, apex rounded.

Colouration. Pale yellowish brown.

Measurements. Length, 21.5; pronotum length x width, 6.7 x 7.5; tegmen length, 9.3.

Nymph. Resembles female except for size (length, 16.5mm), and absence of tegmina and wings.

REMARKS

The habitus of this female resembles that of *Neotemnopteryx douglasi*, but that species (known only from the male) has eyes (variably reduced), and small arolia, pulvilli essentially absent. The absence of eyes indicates it is

restricted to a cave habitat. *Paratemnopteryx stonei* also has been found in Bayliss Cave, but this specimen clearly is not that species.

***Paratemnopteryx centralensis* (Roth)
n. comb. (Figs 29A,B,35)**

Symploce centralensis Roth, 1985b, p. 322, figs 18A-18G, 19A-19I (♂ and ♀).

MATERIAL EXAMINED

Holotype and paratypes from Irian Jaya and Papua New Guinea listed in Roth (1985b).

ADDITIONAL MATERIAL FROM AUSTRALIA. QUEENSLAND. ANIC: Danbulla Forestry Reserve, 13km NE by N of Yungaburra, 17.10S 145.39E, 1♂ (terminalia slide 106), 16.xi.1981, J. Balderson; 3km NE of Mt Webb, near Cooktown, 2♂♂, 3.x.1980, T.A. Weir and R.A. Barrett. The following were collected by J.F.B. Common and M.S. Upton: 1 mile N of Kuranda, 1200ft, 1♂, 23.iv.1969; 3 miles W of Mossman, 1♂, 14.iii.1964, 1♂, 13.iii.1964; 9 miles N of Kuranda, 1♂, 12.iii.1964; 9 miles E of El Arish, 1♂, 7.iii.1964 BPBM: Cairns, 3♂♂, J.F. Illingworth. QMBA: Flying Fish Pt, 2♂♂, 21.i.1965, E.C. Dahms. The following were collected by G.B. Monteith: 3km E of Lockerbie, C. York, 1♂, at MV Light, 30.i.-4.ii.1975; Lockerbie Area, Cape York, 1♂, 13-27.iv.1973.

NORTHERN TERRITORY. BPBM: Darwin, 1♂ (terminalia slide 459), M.V. Light Trap, 1-7.i.1964, J. Sedlacek.

REMARKS

Previously known only from the island of New Guinea, this species was fully described by Roth (1985b, p.322). The epigeic species varies greatly in size and colour. Specimens from Australia are generally smaller, and some are darker brown than New Guinea specimens and very dark brown individuals may have a metallic sheen. The eyes are very large (Fig. 29A) and close together. Pronotum and tegmina usually are covered with spaced upright hairs. Male supraanal plate, paraprocts, subgenital plate and minute styles, and genital phallomeres (Fig. 29B) are similar in Australian and New Guinea specimens (Roth, 1985b, figs. 18,19). As indicated below, *centralensis* probably was the species from which the cavernicolous *howarthi* arose.

Measurements (♂♂ only; New Guinea specimens in parentheses from Roth 1985b): length, 9.5-14.4 (12.3-16.0); pronotum length x

width, 2.6-3.2 x 3.4-4.2 (3.0-3.7 x 3.9-4.9); tegmen length, 10.8-16.0 (14.2-20.0).

***Paratemnopteryx howarthi* n. sp.
(Figs 30A-J,35)**

MATERIAL EXAMINED

HOLOTYPE: ♂, Chillagoe, Queensland, Christmas Pot Cave, 29.vi.1984, F.D. Stone and D. Irvine, Explorers Club Expedition; in QMBA.

PARATYPES: QUEENSLAND. QMBA: All specimens were collected on the Explorers Club Expedition in 1984 to the Chillagoe Caves, Queensland. The following are all brachypterous morphs unless indicated as macropterous (macr.): Tea Tree Cave, 1♂ (macr.), 1♂ (entire insect mounted on slides 48a and 48b), 1♀ (genitalia slide 49), 2.vii., 1♂, 24.vi., F.G. Howarth, 1♀, 1 ootheca, 2 nymphs, 24.vi., 1♂, 3 nymphs, 29.vi., F.G. Howarth, and F.D. Stone, 1♂, 24.vi., F.D. Stone et al.; Christmas Pot, 1♂, 2♀♀, 2 nymphs (swiftlet guano), 5 nymphs, 29.vi., F.D. Stone and D. Irvine. (1♂ (terminalia slide 240) and 1♀, brachypterous paratypes retained in MCZH).

ETYMOLOGY

The species is dedicated to Dr Francis G. Howarth of the Bernice P. Bishop Museum.

DESCRIPTION

Male. Eyes well developed in macropterous morphs extending well below level of antennal sockets (Fig. 30A), but somewhat reduced in brachypterous forms (Fig. 30B), ocellar spots absent; interocular space less (macr.) or greater (brachypterous) than distance between antennal sockets. Tegmina and wings fully developed extending well beyond end of abdomen, or tegmina reduced in length (normal width), reaching to about middle of T5 or its hind margin. Hind wings smaller, membranous, reaching to about hind margin of T2 or T3; in fully developed wings, discoidal, median and cubitus veins straight, the former with 2-3 complete and 2-3 incomplete branches, apical triangle absent (Fig. 30F). Anteroventral margin of front femur Type A₃; pulvilli absent, tarsal claws simple, symmetrical, arolia very small. First abdominal tergum with large, dense group of setae near anteromedial half of segment (Fig. 30D). Seventh abdominal tergum unmodified. Supraanal plate transverse, trigonal, right and left paraprocts dissimilar (Fig. 30C). Subgenital plate almost symmetrical, styles minute, the right somewhat larger with long curved setae, the left one cylindrical, each located near posterior

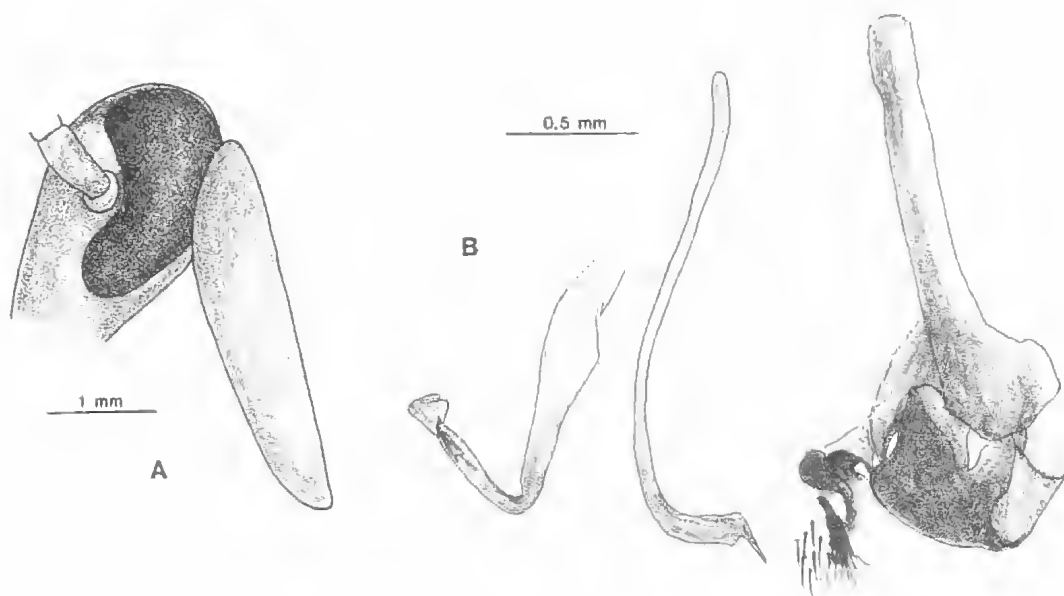


FIG. 29. *Paratemnopteryx centralensis* (Roth), ♂ from Danbulla Forestry Reserve, Qld; A, Eye (lateral view); B, Genitalia (dorsal view).

corners of plate, interstyler margin straight (Fig. 30E). Genitalia as in Fig. 30G: hook on left side, median phallomere a slender curved rod with acute apex, right phallomere with an associated setal brush.

Colouration. Light to dark brown. Lateral regions of pronotum hyaline. In dark morphs, the head may be much darker than abdomen, although the pronotum also may be relatively dark. Tegmina hyaline even in darkest forms.

Measurements. Macropterous morphs in brackets, all others including holotype (in parentheses), are brachypterous: Length, 9.5-11.0 (10.5) [10.0-10.5]; pronotum length x width, 2.6-2.8 x 3.0-3.5 (2.9 x 3.1) [2.8-2.9 x 3.1-3.2]; tegmen length, 4.5-5.7 (5.6) [11.0-11.2].

Female. Eyes narrower and slightly smaller than in brachypterous males, usually not extending below level of antennal sockets. Tegmina and wings reduced reaching to T3 or hind margin of T4, wings smaller extending to about middle of T1 or T2. No macropterous females were seen. Supraanal plate distinctly triangular (Fig. 30H). Right genital paratergite with a small basal swelling (Fig. 30I). An empty notheca (Fig. 30J) is brown with 12 egg cells, 12 shallow keel

serrations, and measures 2.5mm high and 3.5mm long.

Measurements. Length, 8.5-12.3; pronotum length x width, 2.7-3.1 x 3.1-3.5; tegmen length, 3.9-6.1.

Nymph. The eyes of small individuals are greatly reduced and are represented by a narrow strip of dark ommatidia. These increase in number in large nymphs where the eyes almost reach adult size. Arolia and pulvilli absent.

REMARKS

Paratemnopteryx howarthi is very close to, and probably arose from the epigeal species *Paratemnopteryx centralensis* (Roth) (= *Symploce centralensis* Roth) from Irian Jaya, Papua New Guinea (Roth, 1985b, p.322) and Australia. The shapes of the styles and their position on the subgenital plate are similar in both species. Some differences are seen in the shapes of the supraanal plate (in both sexes), and in the apex of the hooklike genital phallomere in the males. The male paraprocts and right genital phallomere appear to have some small differences, but this may be due in part to their orientation on the slides. *Paratemnopteryx centralensis*

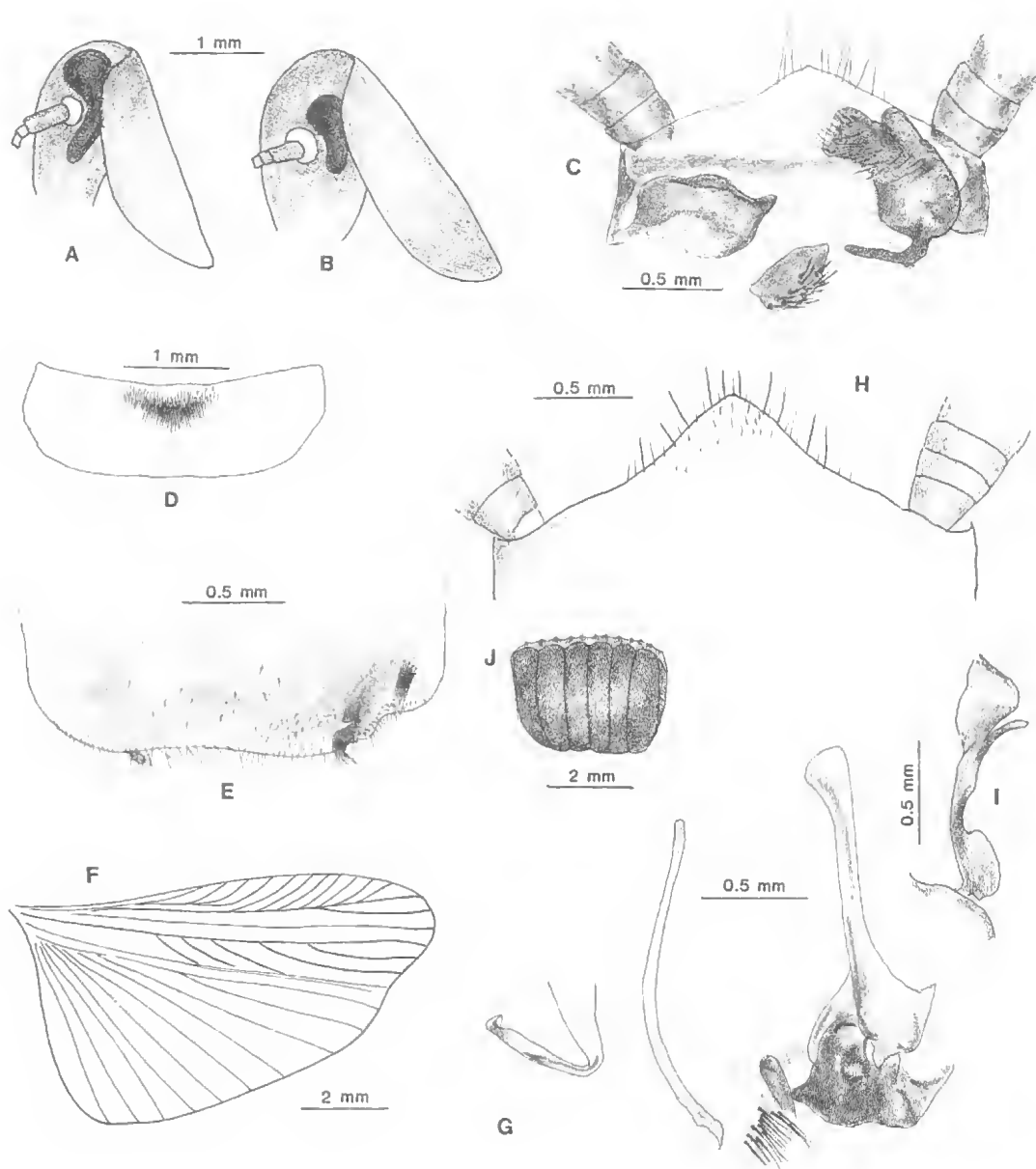
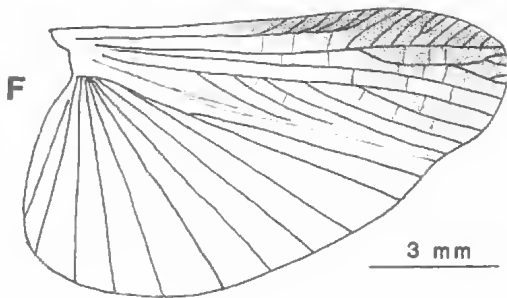
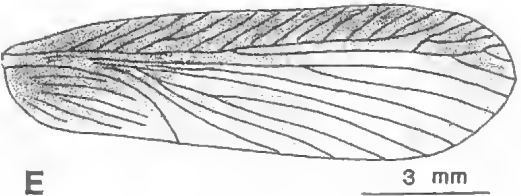
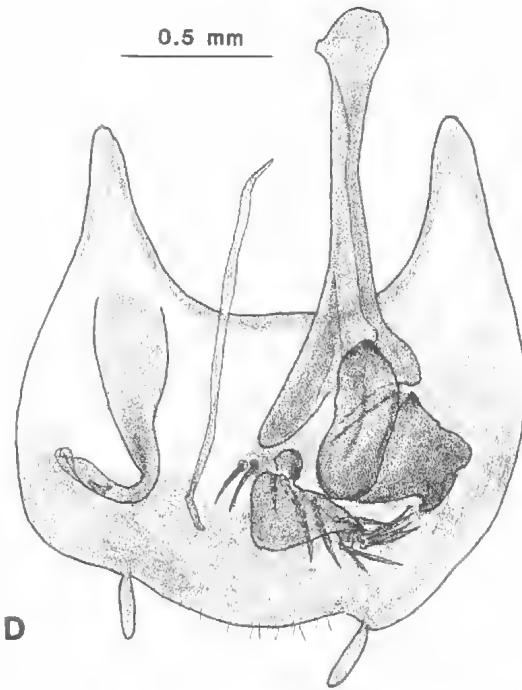
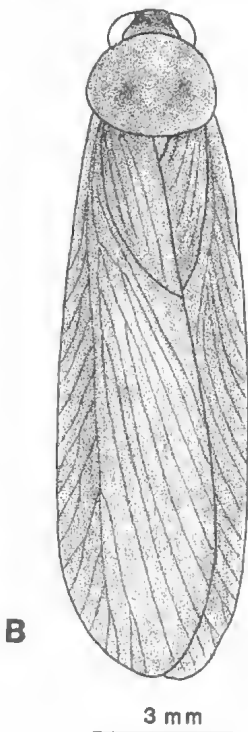
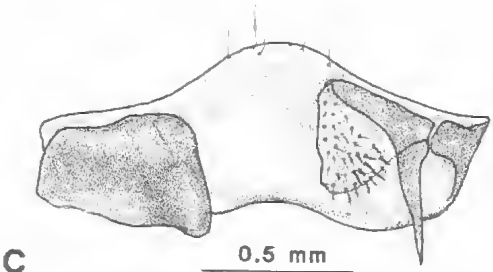
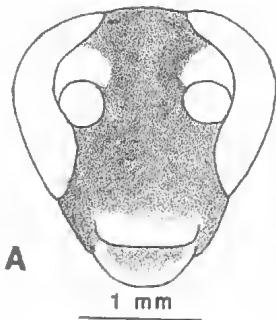


FIG. 30. *Paratemnopteryx howarthi*, n. sp., paratypes. A-G, ♂♂: A, Eyes (lateral views) of macropterous and brachypterous specimens respectively; C, Supraanal plate and paraprocts (ventral view); D, Setal specialization on first abdominal tergum; E, Distal region of subgenital plate, and styles (dorsal view); F, Hind wing; G, Genitalia (dorsal view); H, I, Females: H, Supraanal plate (dorsal view); I, Right paratergite; J, Ootheca. Localities: F, Christmas Pot Cave, all others, Tea Tree Cave, Chillagoe, Qld.

FIG. 31. *Paratemnopteryx suffuscula* n. sp., ♂♂. A, Paratype from Mt Boppy, N.S.W., head; B, Holotype, habitus; C, D, Paratype from Mt Arthur, N.S.W., supraanal plate and paraprocts (ventral), and subgenital plate and genitalia (dorsal); E, F, Paratype from same locality as holotype, right tegmen and hind wing.



varies considerably in size, but generally it is larger than *howarthi*.

The presence of both brachypterous and macropterous morphs of *P. howarthi* in the same cave is of interest. Macropterous individuals have larger eyes than brachypterous morphs, but both forms lack ocelli and pulvilli. The correlation of normal sized eyes with macropterous morphs, and their reduction in brachypterous forms has been shown in another cavernicolous cockroach, *Alluaudellina cavernicola* (Shelford) (Chopard, 1932). This species is found both inside and outside of caves and Chopard arranged individuals in the following categories: 1) macropterous and macrophthalmic; 2) macropterous and microphthalmic; 3) micropterous and microphthalmic. Chopard concluded that in *Alluaudellina*, ocular reduction precedes wing reduction.

The eye and wing reduction in *P. howarthi* does not reach the extreme losses found in *Alluaudellina*, at least in the specimens I have seen. I have seen one male specimen which I am provisionally referring to *P. howarthi*, and which was not taken in a cave [24km N by W of Mareeba, Queensland, 16.47S 145.22E (terminalia slide 141, 24-25.xi.1981, J. Balderson (ANIC)]. It has fully developed tegmina and wings but its eyes are reduced and widely separated and has larger ocellar spots. There are small pulvilli on the 4 proximal tarsomeres and the arolia are small. Its pronotum measures 2.4 x 3.0mm, and the tegmen length is 10.2mm. If this specimen is *howarthi* it may be an epigeic form of the taxon.

***Paratemnopteryx suffuscula* n. sp.**
(Figs 31A-F, 35)

MATERIAL EXAMINED

HOLOTYPE. ♂, 11 miles S by W of Cocklebidy, Western Australia, 32.12S 126.03E, 2.xi.1969, Key and Upton, in ANIC.

PARATYPES. WESTERN AUSTRALIA, ANIC: same data as holotype, 1♂ (legmen and wing slide 214) (Key's field notes, trip 163, Stop 18683.6); Bullsbrook, 1♂, at light, 4.xii.1978, K. and E. Carnaby; Python Pool, nr Mt Herbert, S of Roebourne, 2♂♂, 28.viii.1964, P.B. and L.C. Carne. The following were collected by M.S. Upton and J.E. Feehan: 1km SSW of Millstream H.S., 21.35S 117.04E, 1♂, 30.x.1970; 15km E of Millstream H.S., 21.35S 117.12E, 1♂ (terminalia slide 190), 20.x.1970. WAMP: 70-75km ENE of Narrieman, 1♂, 10-16.xi.1978, T.F. Houston *et al.*

SOUTH AUSTRALIA. ANIC: Buckaringa Gorge,

Flinders Range, c. 20km NNW of Quorn, 1♂, 19.xii.1985, C. Reid, P.W. Gullan, M. Lewis.

NEW SOUTH WALES. ANIC: Mount Boppy, 3♂♂, 25.xi.1949, E.F. Riek, Mt Arthur, nr Wellington, 1♂ (terminalia slide 142), E.F. Riek.

DESCRIPTION

Male. Head exposed, eyes large, extending well below antennal sockets, interocular distance about same as space between antennal sockets (Fig. 31A); third and fifth palpal segments longer than fourth. Pronotum suboval with a pair of depressions on distal half (Fig. 31B). Tegmina and wings fully developed extending well beyond end of abdomen, discoidal sectors of former, oblique (Fig. 31B,E), veins with short, upright hairs. Hind wing with subcosta reaching beyond middle, discoidal and median veins straight, cubitus vein straight with 2-3 complete and 2-3 incomplete branches, apical triangle absent (Fig. 31F). Front femur Type A2; pulvilli subobsolete or absent on proximal tarsomeres 1-3, present on fourth tarsomere, tarsal claws symmetrical, simple, arolia small. Supraanal plate with hind margin convexly rounded, not reaching hind margin of subgenital plate; right and left paraprocts dissimilar, right one with a plate bearing spines, and a long spinelike process (Fig. 31C). Subgenital plate with pair of widely separated similar, cylindrical styles, interstyler margin weakly convex (Fig. 31D). Genitalia as in Fig. 31D: hook on left side with preapical incision; median phallomere uniformly slender, apex unmodified; right phallomere very large, one of the plates bearing a row of large, stout, setae.

Colouration. Brown. Head dark reddish brown, large ocellar spots white, clypeus yellowish white, labrum reddish brown, distal part lighter (Fig. 31A). Last palpal segment light brown, other segments mostly pale. Pronotum with disk yellowish brown or dark brown, surrounding area hyaline or subhyaline. Tegmina reddish brown, hyaline (Fig. 31E). Hind wing with subcosta and costal vein regions and distal half of anterior field infuscated (Fig. 31F). Abdominal terga brown, lateral regions and terminal segments darker. Abdominal sterna brown, segment on distal half, darker. Cerci blackish brown dorsally and ventrally. Coxae with basal halves or more dark brown, remainder pale; femurs mostly pale sometimes infuscated, tibiae and tarsi darker.

Female. Unknown.

Measurements. Length, 9.0-11.5; pronotum

length x width, 1.9-2.3 x 2.5-2.8; tegmen length, 9.9-11.8.

REMARKS

The habitus of *P. suffuscula* resembles that of some species of *Dyakinodes*.

Keyella n. gen.

TYPE SPECIES

Keyella gayi n. sp.

ETYMOLOGY

The genus is dedicated to Dr K.H.L. Key of CSIRO.

DIAGNOSIS

Eyes well developed or somewhat reduced. Tegmina and wings fully developed in both sexes, sometimes reduced in the female; cubitus vein of hind wing with complete and incomplete branches, apical triangle absent. Anteroventral margin of front femur with some large proximal spines followed by a row of piliform spinules and terminating in 3 large spines (Type B₃); pulvilli on 4 proximal tarsomeres of front and mid tarsi only, and only on fourth tarsomere of hind tarsus, or pulvilli on all tarsal segments; tarsal claws simple, symmetrical, arolia present. ♂: first abdominal tergum specialised. Seventh abdominal tergum with or without a specialisation. Intercercal ridge on ventral surface of supraanal plate absent. Subgenital plate symmetrical or nearly so. Two styles, weakly dissimilar. Hooklike genital phallomere on left side.

REMARKS

This genus is closely related to *Neotemnopteryx* and *Paratemnopteryx* and belongs in the Blattellidae: Blattellinae, tribe Parcoblattini. It is readily separated from the above 2 genera by Type B₃ front femur (vs. Type A₃). The morphology of the male setal gland on T1 also differs distinctly from those found in the related 2 genera. *Keyella* appears to be a link between *Neotemnopteryx* and *Paratemnopteryx*; one of the two species is closer to the former and the other is closer to the latter.

Distribution of the 2 species of *Keyella* is shown in Fig. 35.

KEY TO MALES OF *KEYELLA* SPP.

1. Supraanal plate trigonal (Fig. 32B). Seventh ab-

dominal tergum unspecialised. Styles short, stocky, rounded (Fig. 32E) *gayi*

Supraanal plate subtrapezoidal (Fig. 33B,D). Seventh abdominal tergum with a pair of large medial depressions containing a large dense group of setae (Fig. 33B). Styles elongate, tapering (Fig. 33E) *armidalensis*

Keyella gayi n. sp.

(Figs 32A-E, 35)

MATERIAL EXAMINED

HOLOTYPE: ♂, 'dried out of spirit', near Cairns, Queensland, Australia, viii.1966, H.M. Cameron; in ANIC.

PARATYPES: QUEENSLAND. ANIC: Lake Barrine, 1 ♂ (terminalia slide 134), 15.vii.1933, H.A. Gay; Davies Ck, 20km east by south of Mareeba, 17.02S 145.37E, 1 ♀, 19.xi.1981, J. Balderson. QMBA: Shiptons Flat, 35km S of Cooktown, 250m, 1 ♂, 22.iv.1982, Monteith, Yeates, and Cook.

ETYMOLOGY

The species is dedicated to H.A. Gay who collected one of the paratypes.

DESCRIPTION

Male. Eyes not extending below antennal sockets, interocular space greater than distance between ocelli or antennal sockets. Tegmina and wings fully developed the former with unbranched discoidal vein, branches of median and cubitus rami longitudinal. Hind wing with discoidal vein branched or unbranched (may differ on the right and left wings), median and cubitus veins straight, the former simple, the latter with 2 or 3 complete (some may be bifurcate) and 1 or 2 incomplete branches, apical triangle absent. Anteroventral margin of front femur with 6 large spines on proximal half followed by row of piliform spinules and 3 stout terminal spines (the first of these is only slightly longer, but stouter, than the spinules preceding it); pulvilli large on 4 proximal tarsomeres of front and mid tarsi, present only on segment 4 of hind tarsi; arolia very small. Modification on first abdominal tergum consisting of a pair of exposed, small, dense yellowish setal tufts, with a distinct space between them, and on either side an elevation bearing long slender setae (Fig. 32A). Seventh abdominal tergum unspecialised. Supraanal plate trigonal (Fig. 32B), reaching hind margin of subgenital plate; right and left paraprocts weakly dissimilar (Fig. 32D). Subgenital plate

symmetrical, convexly rounded, hind margin pale, membranous, upturned (Fig. 32C). Styles, short, stocky, right one larger, pale ventrally (a continuation of pale margin of subgenital plate), dorsal surface densely covered with small appressed dark spines (Fig. 32E). Genitalia as in Fig. 32E: hook on left side; median phallomere uniformly slender, rodlike, right phallomere well developed with cleft.

Colouration. Dark reddish brown. Portion of right tegmen covered by left, hyaline, colourless. Hind wing with anterior margin darkly infuscated, veins brown.

Female. Tegmina and wings fully developed. Hind margin of supraanal plate less trigonal than male, convexly rounded. Pulvilli present on 4 proximal tarsomeres of all tarsi but small on first and second segments on hind tarsus, arolia very small.

Measurements (♀ in parentheses): Length, 17.3-17.7 (25.0 flattened); pronotum length x width, 5.0-5.1 x 5.7 (sides strongly deflexed) - 6.8 (5.1 x 6.9); tegmen length, 15.8-17.4 (17.0).

REMARKS

The widely spaced styles tend to resemble those of some *Paratemnopteryx* spp.

Keyella armidalensis n. sp. (Figs 33A-E, 35)

MATERIAL EXAMINED

HOLOTYPE: ♂, at light, Armidale, New South Wales, Australia, 14.i.1963, C.W. Frazier, donated by University of New England; in ANIC.

PARATYPES: NEW SOUTH WALES. ANIC: same data as holotype except for collection dates: 1♂ (terminalia slide 135), 13.xii.1959, 2♂♂, 2.i.1960. MCZH: Salisbury Cl., 1♂, xi, Wheeler.

DESCRIPTION

Male. Eyes well developed extending below level of antennal sockets; interocular space same as distance between antennal sockets. Pronotum with sides rounded, hind margin weakly convex. Tegmina and wings fully developed. Tegmina discoidal vein with an apically forked branch near middle, branches of median vein longitudinal, those of the cubitus vein longitudinal and weakly slanted. Hind wing discoidal vein straight, with an apically forked branch beyond middle, median and cubitus veins straight, the former simple, the latter with 3-4 complete and 2-4 incomplete branches, apical triangle absent. Anteroventral margin of front femur Type B3

with 4 large proximal spines; pulvilli present on 4 proximal tarsomeres of all legs; arolia present. First abdominal tergum with a pair of small separated tufts of setae and longer setae along a ridge anterior to them (Fig. 33A). Seventh abdominal tergum with a pair of depressions medially, in which is a large dense group of setae (Fig. 33B). Supraanal plate with hind margin truncate, right and left paraprocts dissimilar (Fig. 33B,D). Subgenital plate almost symmetrical, convex, hind margin upturned. Styles very close together near midline of plate, elongated, somewhat triangular, dorsal surface densely covered with small spines; right style slightly shorter and more robust than the left one (particularly in the pinned specimen, (Fig. 33C), but appears less so in the slide preparation (Fig. 33E). Genitalia as in Fig. 33E: genital hook of left side, with a subapical incision; median phallomere slightly enlarged and acute apically, right phallomere reduced.

Colouration. Light to dark brown.

Female. Unknown.

Measurements. Length, 9.5-12.2; pronotum length x width, 2.5-2.8 x 3.7-3.8; tegmen length, 10.5-13.2.

REMARKS

The closeness of the male styles resembles those found in *Neotemnopteryx styliapedra* (Fig. 13E).

Keyella sp.

MATERIAL EXAMINED

NEW SOUTH WALES. ANIC: Durras North, near Batemans Bay, 1♀, 23.xii.1984, H.M. Cameron

DESCRIPTION

Female. Eyes reaching slightly below level of antennal sockets; fifth palpal segment swollen, distinctly larger than the fourth. Tegmina reduced in length, width normal, tapering apically rounded reaching to hind margin of T3. Hind wings smaller reaching slightly beyond hind margin of T2, folded longitudinally down middle, veins present. Supraanal plate trigonal, apex rounded. Front femur Type B3, pulvilli present on 4 proximal tarsomeres of all tarsi, arolia present, tarsal claws simple, symmetrical.

Colouration. Pronotum and abdominal terga dark reddish brown. Head, hyaline tegmina, cerci and legs light brown. Hind wings infuscated. Abdominal sterna light brown, its sides and subgenital plate darker.

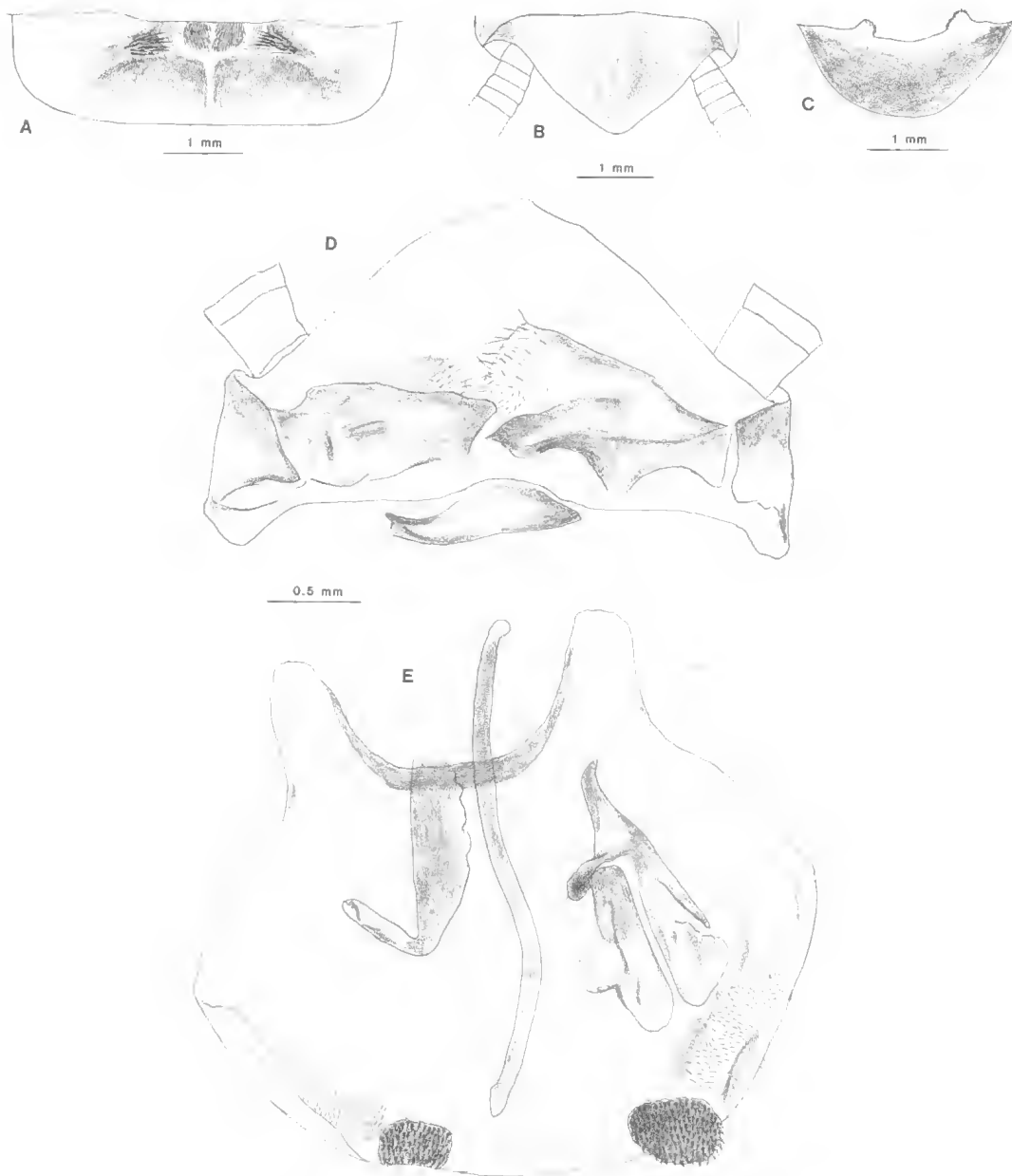


FIG. 32. *Keyella gayi*, n. sp., ♂ paratype from Lake Barrine, Qld: First abdominal tergum and setal specialization; B, Supraanal plate (dorsal view), C, Subgenital plate and styles (rear view); D, Supraanal plate and paraprocts (ventral view); E, Subgenital plate, genitalia, and styles (dorsal view).

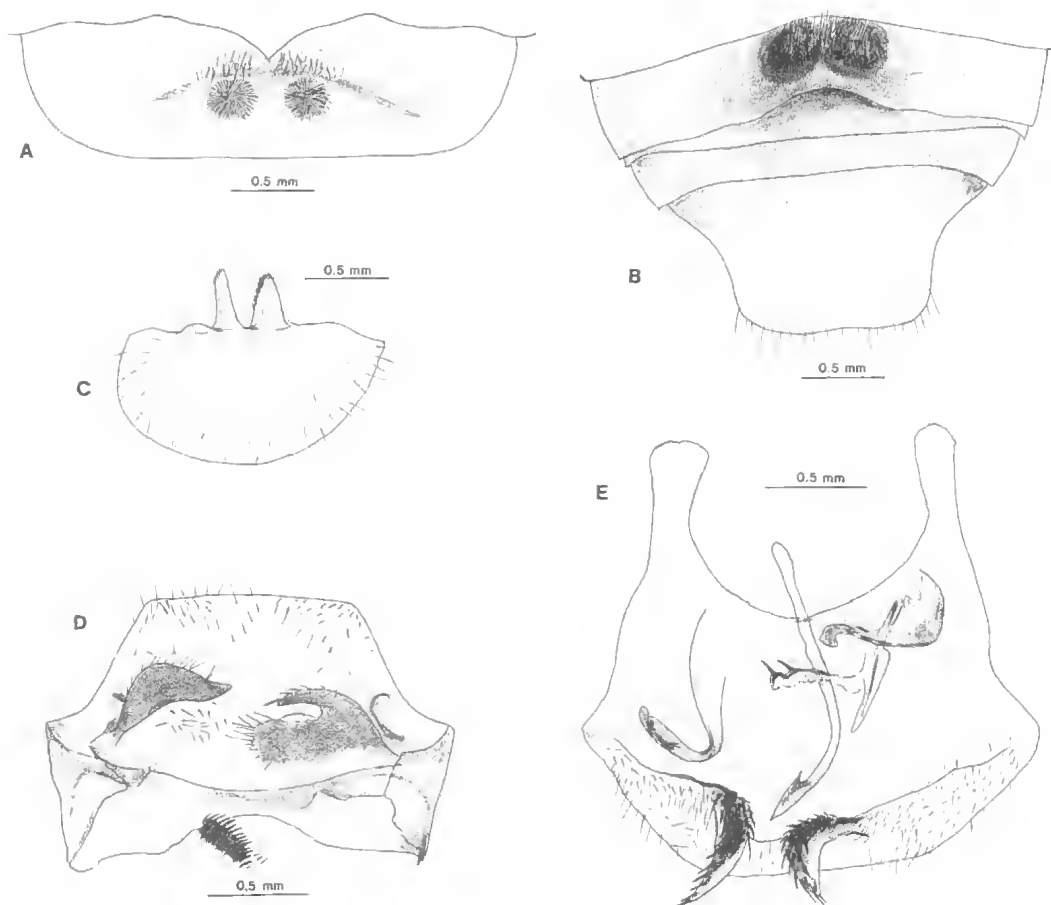


FIG. 33. *Keyella armidalensis*, n. sp., ♂♂. A-C, Holotype: A, First abdominal tergum and setal specialization; B, Abdominal tergum 7 (with setal gland) to supraanal plate; C, Subgenital plate and styles (rear view); D-E, Paratype from Armidale, N.S.W.: D, Supraanal plate and paraprocts (ventral view); E, Subgenital plate, genitalia, and styles (dorsal view).

Measurements. Length, 10.0; pronotum length x width, 2.5 x 3.6; tegmen length, 4.2.

REMARKS

The supraanal plate of this specimen resembles that of male *K. gayi* and it may be a brachypterous female of that species. Males from Batemans Bay are needed for specific determination. The unnamed female looks like a very small specimen of *Paratemnopteryx coulouiana* (Prin-

cis) but its Type B₃ front femur distinguishes it from that species (and genus) which has Type A₃.

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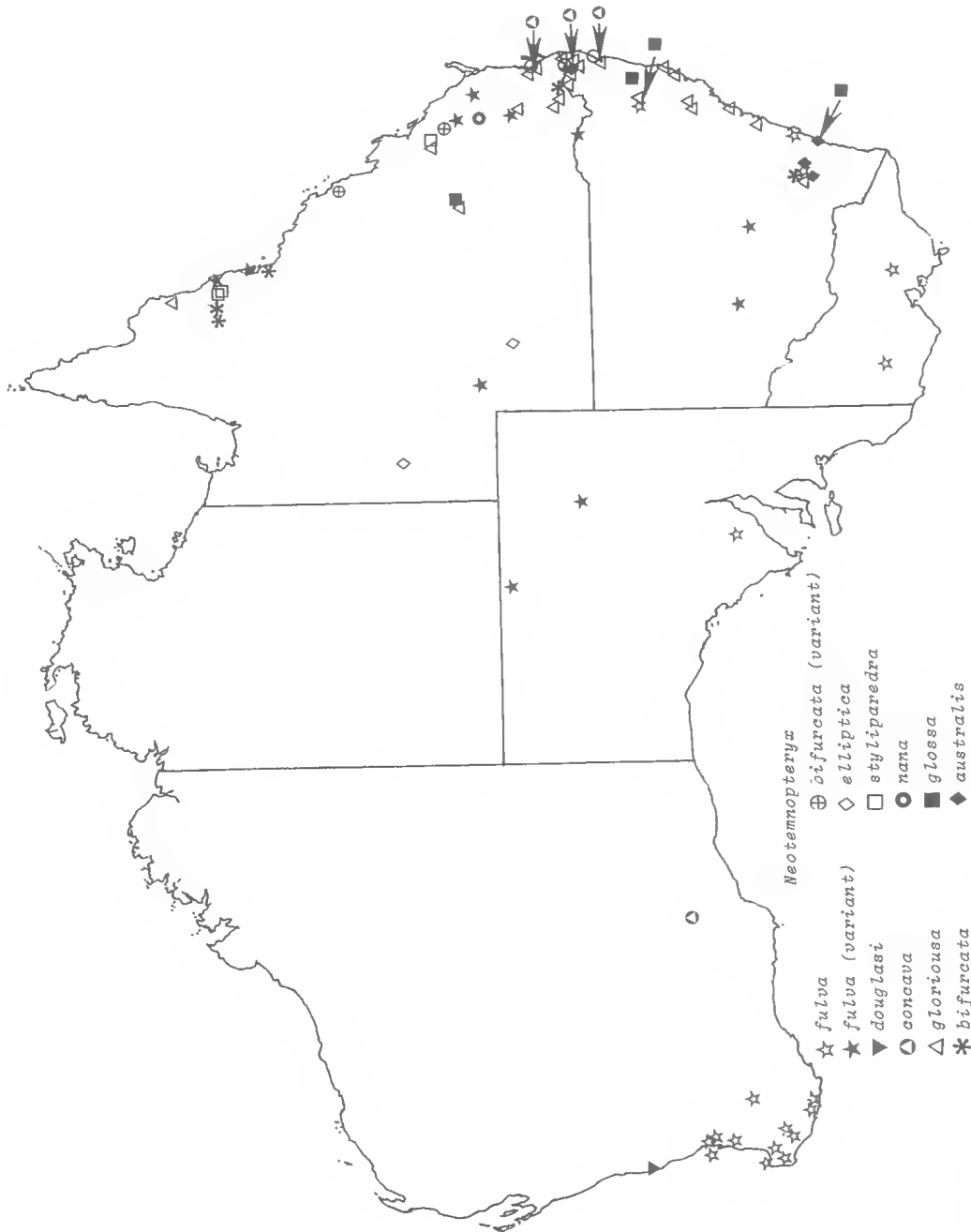


FIG. 34. Distribution of *Neotemnopteryx* spp. in Australia.



FIG. 35. Distribution of species of *Paratemnopteryx*, *Troglablattella*, and *Keyella* in Australia. New Guinea records for *Paratemnopteryx centralensis* are shown for Papua only; those for Irian Jaya are not included.

for partial support, and Dr D.C. Rentz for his aid with the maps.

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